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THE AMERICAN GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME LII.—No. 14. Whole No. 774. | NEW YORK, MONDAY, APRIL 7, 1890. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
JOS. R. THOMAS, C.E., Editor. T. J. CUNNINGHAM, Asst. Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y. AS SECOND CLASS MATTER.

Published on each Monday of the year, at No. 42 Pine Street, N.Y.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European countries, $4.50 (19 shillings—22½ francs). All payments to be made in advance. Single copies, 10 cents.

Remittances should be made either by post-office order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

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BRIEFLY TOLD.

THE RHODE ISLAND GAS GRAB.—In our item columns will be found the latest news that we have respecting the attempt of certain capitalists to levy on the capital invested in the Gas Companies at Providence and Pawtucket, and interesting reading it will undoubtedly make. It is with satisfaction we note that the local authorities, who are ignored completely in the measure now under consideration in the Legislature, are disposed to resent not only the slight thus put upon them, but seem moved by the further impulse to protect the property that contributes so much to the comfort and convenience of the citizens. This is as it should be; and while we are not of the opinion that the Rhode Island Legislature or its chief executive officer—Governor Ladd—will authorize the grab in the consent of the State, we nevertheless believe that vigilance in watching the doings of the schemers will be necessary to defeat them. Another lesson that this attempt teaches is the absolute necessity that exists for the enactment of laws placing the gas business under the control of State Commissions.

SCANT JUSTICE.—In 1886 the authorities of Toronto entered into a public lighting agreement with the Consumers Gas Company, of that city, under which the latter was authorized to carry out an improved system of street lighting by gas, at a certain figure, the contract to last for 5 years, or until Jan. 1, 1891. In order to fully carry out the compact the Gas Company invested large amounts of money in lanterns and burners—the Lambeth type was most largely favored—and the expenditure on that account was supplemented by an investment of something over $100,000 in new mains, which were put down in streets that were ordered lighted by the authorities, but in which the Company had not theretofore distributed gas. The service was fully up to the contract, but meanwhile the authorities became enamored of electric light, and taking advantage of a strained and peculiar construction of a clause in the contract with the Gas Company, it was not long before the latter was ordered to make wholesale discontinuance of its public gas lamps and lighting. So great had this drain become that Manager Pearson, of the Company, finally appealed to the authorities, and in a well-tempered argument showed that 279 ordinary and 106 Lambeth lamps (costing but $13,454.50 per annum to maintain) had been discontinued, while the electric lights substituted cost $19,764.03 per annum. As it was proposed to still further decrease the gas service, Mr. Pearson appealed to the authorities to stay their hands until the gas contract had expired. It was finally determined not to further decrease the number of gas lamps in use until the expiration of the contract; and we presume the Gas Company ought to consider itself fortunate in obtaining even this scant measure of favor.

HINTS FROM ALTON, ILLS.—When Mr. William Tracy took charge some months ago of the works of the Alton (Ills.) Gas and Electric Light Company, we had occasion to remark that he was sure to make his individuality felt in directing the affairs of the Company. Now that the several plant improvements have been completed, or at least have been so far advanced that advantage may be taken of the same in carrying on the business, we are treated to the following notice, published by Secretary and Superintendent Tracy, under authority of President Campbell:

"Commencing May 1st, the price of gas will be $2.50 per 1,000 cubic feet. If bills are paid on or before the 6th day of the month, a discount of 50 cents per 1,000 feet will be allowed, making the net price $2. An additional discount will be allowed large consumers, as follows:

Monthly Consumption.	Discount.	Net Rate.
5,000 to 10,000.....	5 per cent.....	$1.90
10,000 to 15,000.....	10 "	1.80
15,000 to 20,000.....	15 "	1.70
20,000 to 25,000.....	20 "	1.60
25,000 to 30,000.....	25 "	1.50
30,000 and over.....	30 "	1.40

"All consumers using gas stoves for cooking purposes during months of May, June, July, August, September and October, will be allowed a discount of $1 per 1,000 feet, if bills are paid on or before the 6th day of the month. With this very low price of gas in the city of Alton, we look for a liberal patronage." Of course there is no reason to doubt that this liberal policy will be well rewarded by the people of Alton in a largely increased use of gas by them. This is the second reduction in gas rates at Alton in the last two years, and it should be remembered that the Company is in no wise exposed to competition of any sort, since its proprietors are also in full control of the electric light supply of the city. In his letter to us on the subject, Supt. Tracy says that the consumption of gas is steadily increasing. He has orders on his books for the placing of 22 gas stoves in this month, which is a rather remarkable showing when it is remembered that the total number of stoves hitherto disposed of to users in the city was only 37. Our go-ahead Superintendent is now of the opinion that Alton will have 125 stoves in use by September 1st. This may only be a small straw in the direction of indicating the increasing popularity of gaseous fuel; but such are nevertheless quite as potent in proving the drift of sentiment as are the "larger sizes."

UNIFORM THEM.—We do not suppose that there is much room for argument over the proposition that the employees of a gas company whose duties call upon them to enter the houses of consumers should be uniformed. The last example we have of the necessity for this is reported from Baltimore, where an enterprising thief has, under the guise of a gas inspector, been robbing the houses to which he gained entrance.

[Communicated Article.]

Practical Hints on Purification with Lime.

By FREDERIC EGNER.

Having received a number of inquiries from brother gas men asking if the writer could explain the reason why the amount of gas purified to the bushel of lime used was, for a time, greatly reduced at their works, without any apparent cause therefor, he thought the following item of personal experience would perhaps be interesting to the readers of the JOURNAL. In each case the statement was made that the same kind of coal that had been used for years past was used then; and so it was with the lime, and even the men employed who handled the material; and yet the number of cubic feet of gas purified to the bushel was all at once reduced to less than one-half the usual average. The apparatus and method of operation would be described, and, so far as one could judge from that, everything was as it ought to be; yet still the fact remained that where perhaps 20 and more thousand cubic feet of gas were purified before to each bushel of 80 pounds of stone lime used, now not over one-half of that amount could be passed through the boxes when a change would have to be made.

In view of the above statements the writer was puzzled to account for this state of things for a time until the same happened at the works of which he had charge. It was in December, some years ago, when we had our first experience of the kind mentioned. All at once the purifiers had to be changed more frequently than the increased quantity of gas made warranted; and with each day the matter became worse, until we investigated thoroughly, and found the cause. We were using the same kind of coal—yes, even from the same pile—which we had previously used when purifying 22,000 to 25,000 cubic feet of gas to the bushel of unslaked lime. The lime was fully as good as at any time before; and the men who did the work were the same, and were known to be faithful, hard-working men. And while the trouble lasted these men worked much harder than ever, but for all that we had to employ nearly double the force, and certainly had to buy more than double the amount of lime.

Samples of the lime were carefully analyzed, and found very good, before using; the lime was examined after it was prepared for the boxes and found to be apparently just right; the foreman of the purifiers assured us that he was doing everything as he had always done it, and there was no reason to doubt his honesty, as he and his men worked much harder than ever before. But the fact remained that the results grew no better, but worse, as the season advanced. So at last we resolved to remain in the purifying house for a time with the men, to see if after all the fault was not there, as nothing could be found wrong elsewhere which could cause the trouble. We did not have to stay long. Within less than half a minute after seeing the men slake the lime we knew where the trouble was, and applied the remedy at once.

The manner of preparing our lime used to be as follows: A bed of lime containing about 50 bushels was made on the floor something like bricklayers make their mortar beds. The unslaked lime was spread in a thin layer, not over 4 to 5 inches deep, and then nearly the whole quantity of water needed was poured over the lime by means of a large hose and some barrels which had been previously filled. As the lime slaked it was turned over, by means of long-pronged rakes made for the purpose. After having been well slaked, about one-tenth of its bulk of screened coke breeze was added, and the whole thoroughly mixed and moistened, until if a handful were taken and tightly squeezed it would stick together and show the imprint of the fingers; and thus prepared we would purify on an average over 22,000 cubic feet of gas to the bushel (80 lbs.) of unslaked stone lime, when using Pittsburgh coal. This was a somewhat tedious process of preparing lime, but it paid for the trouble.

Now, as the season advanced, our foreman, hoping to keep up with the increased demand without employing additional labor, made some *improvements*, as he believed, in the process of slaking lime. He would spread a hundred or more bushels on the floor in layers 8 to 10 inches deep. Then he would turn the big hose on the lot, and when the top of it was about the consistency of stiff mush he would have a man go over the bed with a small hose, at the end of which was a half-inch pipe, and with that he would prod around the pile, sticking it—with the water turned on—to the bottom at short intervals. Then he would spread the coke breeze as before and mix it all.

When mixed, the lime appeared to be all right, the same as when slaked properly; but it was nothing of the kind. The lime was more than half destroyed by the above described method. True, the man could slake treble the quantity of lime with the same labor, but it was misdirected labor, well intended on the part of the foreman, but ruinous as to results, as has been shown. Within two days after stopping the above "improved method," and insisting on the old way, we had our old results back, greatly to our good foreman's surprise, who could not see before any difference between his new way and our old way of slaking lime. But the results did not convince him, as they would almost anybody who may be similarly troubled, for a few years afterwards he repeated his experiment, with the same effect as before. But he was quickly found out, and we shall have no more trouble that way.

We had blamed wet coal, defective center seal, water gas made in connection with coal gas, possible furnace gases drawn in perhaps by running exhauster too fast—everything we could think of—with the falling off in our purification; but here it was, simply the improper slaking of the lime; but for all that it needs the frequent care of the Superintendent to insure the best results, like everything else connected with the manufacture and distribution of gas.

The Market for Gas Securities.

During the week, some improvement was manifested in the dealings in city gas shares, and Consolidated was in demand at something over last week's quotations. Transactions at close of week were done at 96¾ to 97, with the tone all in favor of still better figures. Mutual is higher, and Equitable shows no change of moment. Chicago Trust is at 45⅝—ex-dividend, the payment of which may cause serious trouble. Baltimore Consolidated is unsettled, but it would seem as though the worst had been reached. Providence and Pawtucket (R. I.) shares have not been greatly disturbed over the appearance of the Wakefield Manufacturing Company as a possible competitor in the gas supply of those cities; and Wilmington shares hold their own, although Engineer Conde is out with a notice that the Oxyhydrogen Gas Company, of Wilmington, Del., is ready to take applications for services for intending consumers, the gas to be laid on next fall. This notice is intended as a stock argument—in other words, that the owners of the old Wilmington Company had better sell out. Why they should, we fail to see. They can hold their own easily in any contest that may arise.

[OFFICIAL REPORT.—REVISED BY THE SECRETARY—CONTINUED FROM PAGE 433.]

SIXTH ANNUAL MEETING, OHIO GAS LIGHT ASSOCIATION.

HELD AT THE BOODY HOUSE, TOLEDO, OHIO, MARCH 19 AND 20, 1890.

FIRST DAY—MARCH 19—MORNING SESSION.

The President then read the following address:

PRESIDENT'S ADDRESS.

Gentlemen of the Ohio Gas Light Association:—A year ago we adjourned our last session at the beautiful interior town of Mansfield. Your action at that meeting charged me with the duty of presiding at this. How wisely you bestowed your compliment remains to be seen. Personally I was then, and am now, fully conscious that you might have made a better selection, but with renewed thanks for your compliment, and the hope that your leniency for shortcomings will not be entirely withheld, permit me to extend you a hearty greeting and welcome to this our Sixth Annual Meeting in this thriving city of our Northwestern border. A year is not a long time, and relatively to most of us it doubtless seems short, yet is ample and sufficient to work important changes for us, either for weal or woe. What greater change than the sleep that knows no waking for those who go and also for some that remain? Man, as a gregarious animal, numbers among his keenest pleasures that of greeting the returning friend, and sorrows without comfort at the final parting. As an Association we mourn no break in our numbers, and have cause to thank a beneficent Providence that the year has been thus kind to us. But as part of a fraternity may we not properly pause a moment here and be reminded that death seeks a shining mark, when we recall such names as King, Cushing, Forstall, Parrish and Button? Their names were not on our roll, but all were able, and more than ordinarily bright lights in the fraternity that we call ours. They were well and favorably known to most of us, and perhaps between all of them and individuals of our membership existed ties of attachment of more than ordinary tenderness. May we not appropriately pause and bow the head in silent communion with our own thought, remembering with thankfulness that we are not called to make official record of our own departed? May this opening and coming year be as kind in this regard to us as an Association as the one just closed has been. As an Association representing the interests of companies whose industry is not without competition, and whose environments are necessarily exceedingly various and constantly changing, may we not on the whole be satisfied with the results of the past year, and take courage for the future in view of the present outlook? If we may judge from many individual reports, and from the sentiment voiced by our technical journals, most companies are rejoicing in an increased output of their main product, and those who have steadfastly pinned their faith to the straight coal process are comforted by a marked advance in the value of residuals; all of which tends to reassure investors in gas undertakings. Of our modern industries, some are tributary and some are fundamental. The former having served a temporary purpose, pass out of use and are forgotten. The latter are perhaps variously modified according to exigencies that may arise, but in a general way remain as factors of our civilization, and we tersely speak of them as having come to stay. Steam and gas seem to be permanent examples of the latter, coming into practical use and being developed on somewhat the same general lines; there have been times in the past when the future usefulness of both seemed to be menaced, and the faith of those most interested rudely shaken. That both have thus far stood the test of practicability goes without saying.

Concerning the gas industry and the immense investments involved, the discovery of petroleum, and the economical conversion of mechanical power into electric currrents with their phenomenally rapid application to practical uses, seemed so to menace the future of gas that the observant looked on with bated breath, while timid gas men whistled to preserve their courage. Particularly was this true in the early eighties. An interview about that time with an eminent electrician and inventor, familiarly known as the "Wizard of Menlo Park," is still fresh in memory. The relative possibilities and probabilities of gas and electricity in the field of artificial illumination were discussed at length. Among his concluding remarks the man of electricity said, half reflectively, and with manifest candor, "Oh, yes, we shall doubtless let you down easy." This was about ten years ago; to-day, as then, we hear what is to be, and this is natural and in entire accord with that worthy ambition that constantly strives for something better, and without which there would be no advancing civilization, none of the progress of this progressive age. Our own industry, that industry in the interests of which we are gathered to-day, has been builded in the past and will be developed in the future upon these same general lines. Startling or sensational developments we should not expect, however wonderful or incomprehensible the process submitted for our inspection or investment may appear. But, on the other hand, we may reasonably look for advantage when scientific demonstration and practical accuracy unite to complete a process. In so far as intelligent and persistent industry obtain in the conduct of our affairs, so will the measure of success be. Looking backward over short periods of time, long strides of progress are not manifest, but over *several short periods*, aggregating say twenty years, the difference between then and now is very marked. Measured by the crucial comparisons of dollars and cents, the relation is very nearly as one to three; and so accustomed has the consumer become to frequent and considerable reductions that he continues to ask with the utmost assurance "When will the price of gas be reduced?"

It is significant of the general faith in the future of gas that so much capital is being invested in dependent industries, the managers of which, in their zeal for their specialties, are becoming most potent influences in the matter of educating the public to a higher appreciation of the possibilities of gas. But while the modern idea of combustion is in striking contrast with the phlogistic theories of a past age, the practiced application of the principles of combustion that we make is even more discreditable to our time, and the more especially since it is so well understood that the gaseous form is essential to combustion. It is comforting, however, to note that the industries above referred to, such as the manufacture of stoves, engines, regenerative lamps and various heating appliances, are being conducted with increasing recognition of the principles involved in combustion, and that the near future promises such increased efficiency as will materially hasten the day of cheaper gas, the millenium alike of the manufacturer and the consumer.

And this suggests the reflection that intelligent use on the consumer's part is more or less a factor in the solution of that problem. And further, the increasing and multiplied forms of devices for using gas make this a constantly increasing necessity, not that they are complex or difficult to manage, but to turn the key and strike a match is the beginning and end of all law in this regard with the average consumer.

And since gas from being a luxury has become a necessity, and the manufacturer and consumer from being more or less indifferent, if not actually hostile to each other, have come to the attitude of mutual citizenship, it would seem that this advance toward cheaper gas should be easily made. Or, to put the case a little differently, has the manufacturer performed his part fully when he contents himself with furnishing a good article? May he not go further in the interest of the company he represents and its patrons and dispense information that may not so readily be obtained from any other source?

In the March issue of a New York paper, under the head of "Gas Fuel," appears three columns of such valuable matter in this direction that I feel justified in calling your attention to it, although all present may have already carefully perused it. So much has been written within a few years past upon the subject of gas fuel, and especially since the extensive development and use of natural gas, that it seems almost superfluous to add anything here, and more particularly as we are promised a paper, entitled "Another Year with Fuel Gas," from Mr. C. H. Evans, and which will doubtless give us his practical experience. I had also hoped we might hear from Mr. Wood, some account of his experience with the Loomis system in Sandusky; but perhaps we look to St. Louis with the more eager expectation. That situation then seems exceptionally favorable, and the hands of our own McMillin will steady the helm. Referring to the other papers on our list, I learn with regret that we shall not hear from Mr. Bate on "Theory and Practice in Gas Management," and that he may not even be with us on account of sickness.

Opinions vary greatly, especially among those without practical experience, as to the advisability of gas companies engaging in electric lighting. That such combination is sometimes justified there is no doubt, and perhaps more especially so in the *small* town where there is a demand for both lights, but for either separately a limited one. Mr. Bower's practical experience will surely interest all of us.

"Graduated Versus Uniform Rates" is certainly not a new question for gas men to consider, but the chair ventures the suggestion that when Mr. Faben gets through with his paper new opinions are more than likely to have been formulated. Those of us who have read "Looking Backward," by Edward Bellamy, may have encountered difficulties with the thought that it should be possible for a sane man to clothe the government with such extraordinary powers, but whatever view Mr.

Wilkiemeyer presents in connection with "Municipal Control of Lighting" will command respect, whether all agree with him or not.

The lighting of streets is so important a part of the public service, whether by gas or electricy, that Mr. Hedges' "Statistics" may be expected to constitute a valuable addition to the literature of our meeting. That no two gas companies deliver their output under precisely the same conditions goes without saying, and to hear the "Advantages of a Combined Coal and Water Gas Plant," from a practical standpoint, as Mr. Light will present it, will undoubtedly interest all present. If Mr. Hyde's paper, "Our New Coal Gas Works," is as creditable to his literary ability as the works themselves are to his engineering skill, we are assured a literary treat. In addition to the papers thus briefly alluded to we have eleven questions published, all of which are interesting and of practical importance; so much so that it would seem that there should be no lack of interest so far as the literary programme is concerned, and the success of the meeting thoroughly assured. Many points of interest suggest themselves for presentation here, but with a feeling that the opinions of those who have prepared subjects for your consideration should by no possibility be forstalled, my remarks should be as clearly as may be apart from those likely to be presented by others. Again, most technical questions are very fully discussed in our journals from time to time and may not profitably be reviewed here. There are, however, some matters of interest to us as an Association, and possibly a few thoughts of general interest that may properly be presented by the Chair. A Legislative Committee was appointed at Mansfield, which seems an important one. When the members for this year are appointed, as an insurance of their usefulness, I beg to suggest that both their duties and powers be clearly defined.

The question as to whether under the present statutes gas companies can by vote of their stockholders amend their charters so as to enable them legally to engage in the manufacture of electric light, is one of great importance. I am credibly informed that the Attorney General has decided this question adversely, and for the reason that such amendment would be a substantial change from the original purpose of their organization. The correctness or validity of this decision, if it be such, might easily be tested by mandamus proceedings which it is believed would involve no great amount of expense. The other alternative involves incorporation under a new charter, and I believe has been the course of more than one company during the past year. That there is a growing sentiment particularly among legislators favoring the exercise of municipal control, not only as to street railway and water companies, but gas companies as well, seems an undoubted fact. That such control, so far as we know it in the United States, has not been in the past, and is not now, conducive to the furnishing of cheap gas to the consumer, history clearly proves. This and the fact that some sections of our State laws bearing on the business of gas companies are at variance with each other, would seem to justify an effort on the part of our companies and this Association to secure needed amendments or change. That this Association has been a factor of benefit to the gas interests of Ohio and territory outside of our borders none will deny.

There are 78 gas companies in the State aside from those using natural gas exclusively. Twenty-eight of these are, as yet, unrepresented in this Association. Our Secretary has sent yearly invitations and circulars since our organization. Although a baby Association, we are a lusty little chap, but nevertheless need and ought to have the help of the 28. On the other hand, if united with us, they would derive benefits many times the value of their cost; and I respectfully urge the members present to come up to the help of the Secretary and assist in bringing these outsiders into the fold.

And while in the invitation business, let me say, in a whisper, that there are also a small number who are identified with us by membership in our Association, but who never attend its meetings. To such I say, come up and help to receive and impart the mutual benefits to be derived from our Association, not the least of which are those that come by the mere fact of our coming together.

Not long since every gas company was a finished and completed thing in itself, and so far as the outside world was concerned was literally and metaphorically fenced in. Mystery and reserve their governing characteristics, they were alike unapproachable by consumers and reserved to each other. That such barbarism of the quite recent past has given place to the intelligent, enlightened, and vastly more profitable relations of the present, by virtue of the organization and successful maintenance of gas associations, may be stoutly averred and successfully maintained. A volume might be written and the story of their valuable work and influence still remain untold. None should erroneously suppose that that work and influence is confined to the time occupied by the annual gathering. On the contrary, much of the labor performed and thought presented in our assemblies, together with valuable information and details from various sources, become crystalized for use in the intervening time. We employ and make a pretence of paying one man, whose time of service extends through the entire year, and to whose earnestness and faithfulness much of the crystalizing effect is due. Through him, by correspondence and otherwise, a large part of our vitally necessary work is performed. Right here pardon me if I step on delicate ground, but when you have carfully considered what shall be presented, I trust you will not be moved to censoriousness. We are all more or less, and within qualifying limits, responsible for the valuable results of our meetings, and but little more remotely for the success of this Association, which exerts so potent an influence on the gas busiuess itself. As already intimated, the present attitude of gas men toward each other is a vast improvement upon that of the former times; but there is still room for more. No man, not even a gas man, can live wholly within and unto himself. To the best of us comes a time when we seek information, and what we seek we should be equally ready to impart. That there should be no office secrets it is not intended to assert, but in a general way, if information is sought—say as to the conduct of manufacture, or business policy, or data bearing thereon, either for local use or as statistics for the general good of the fraternity—are not those who neglect or refuse a reasonable answer short-sighted, and do they not stand in their own light? Surely they have everything to gain and nothing to lose by being freely communicative in such cases. It is a matter of regret that there is here and there one, partly buried in the forgotten past, that seems to think otherwise. It is believed, however, that such are not good gas men. From year to year our Secretary requests papers for our meetings, commencing a goodly time in advance, but generally the burden of anxiety upon that score is not removed until the very near approach of the meeting itself. Excuses are more plentiful than favorable replies, one has bought a farm, another a yoke of oxen, while a third must needs take a wedding trip And this is not the worst phase of the matter, some totally ignore his letters answering neither one way or another. Such apathy and indifference reflect upon the courtesy and progressiveness of those refusing to respond, and if all were like them would presage ill for the future of the gas business in these days of competition. I trust I have not been simply censorious in these remarks; if I have been I wish to be forgiven. They have been suggested not in the belief that they apply generally, or to any considerable portion of our number, but somewhat with the thought in mind, that even where they appear to apply, it is more because proper recognition is deferred and finally forgotten in the press of multiplied duties, and possible neglect of system in matters of correspondence. May I add, this is the census year, and it is as incumbent upon us to be faithful in imparting such facts as deserve permanent record, as it is the duty of those appointed for such purpose to record them. You hardly need be reminded that the time for the Columbus Fair at Chicago is rapidly approaching, and that some responsibility rests on each of us to the end that the gas interest be represented there in a manner commensurate with the vastness of its magnitude.

In the past, and very generally in the present, the gas business has fallen into the hands of, and has been and is being directed by, men who have drifted into it by chance or from force of circumstances. Bright men for the most part (they never would have been gas men had they been otherwise), but nevertheless not especially educated or prepared for the practical duty of manufacturing and distributing gas. Other industries not as important in the magnitude of their financial investments, or yet in relation to public necessity, find it important, and even necessary for their successful maintenance, that the practical management be committed to men of special education, and that of a high order. Indeed, the general appreciation of the value of technical education is becoming more manifest every year; it is even becoming an essential part of the public school system. Right here in Toledo is a manual training school under the auspices of the Board of Education, the privileges of which are open to any pupil having entered the High School grade; and when such pupil graduates, to his usual scholarly attainments is added more than a fair knowledge of a half dozen different trades. If in the future gas shall realize the full measure of its possibilities, its management must be characterized by a high order of intelligence. This thought is not advanced here as an original idea—or more properly as a new idea—but rather to emphasize its importance, and stimulate action that shall culminate in something tangible.

Gentlemen, some apology is doubtless due for the disconnected and perhaps somewhat irrelevant character of this presentation. Recent sickness in my family, and extraordinary attending cares connected therewith, have prevented the bestowal of such thought for the interest

of this meeting as would otherwise have been given. It may occur to some that the more careful consideration and presentation of the technical details pertaining to the practicalities of our industry should have been more particularly considered. Personally, I hold the opinion that the interest of our meeting is more particularly in the hands of the membership. The list of practical papers that we are to have from them fully insures success in that direction, and certainly so if we make the most of the opportunity that their reading will afford. It has often been remarked that cordiality and freedom particularly characterized the meetings of the Ohio Association. I sincerely hope that such will be the case on this occasion. I have already occupied your time at too great length, but feel that you will indulge me in saying that when gentlemen prepare papers for us, it is fair to presume they do it at some personal sacrifice of time and mental labor. Of course we thank them, but it is due to them and to ourselves that we make the most of the papers. To that end there should be the utmost freedom in discussion. Very often it brings to the surface points necessarily only partly brought out in the paper itself. Furthermore, failure in discussion is discourtesy to the writer and loss to the meeting at large. The meeting is in your hands, and will be a greater or less success as you elect to have it. Gentlemen, I thank you for your kind attention.

On motion of Mr. Printz, a vote of thanks was tendered to the President, and the address was referred to a committee (Messrs. Printz, Gwynn and Wilkiemeyer) to examine and report in regard to the suggestions contained therein.

The President—Gentlemen, the next thing on our programme is a paper, entitled "Theory and Practice in Gas Management," by Mr. Bate, of Canton. Mr. Bate will not be present, neither shall we have the paper. We have a paper by Mr. Geo. W. Bowers, and as he is not present, I would suggest that the paper be read by the Secretary.

The Secretary then read the paper by Mr. Bowers, which was on the subject of—

COMBINATION OF GAS AND ELECTRIC LIGHTING IN A SMALL TOWN.

This subject must be considered in two lights. To be able to discuss the matter thoroughly it will be necessary to take the actual experience of the old Hillsboro Gas Light Company and repeat part of its history. It may sound as though the present Company is, through its representative, throwing reflections upon the citizens of Hillsboro—which is not done with any intent—but it is necessary to make the comment so as to thoroughly discuss the title of this paper.

The population of Hillsboro is in the neighborhood of 4,000. The Company (in 1875) secured from this corporation a contract for the period of 10 years, as follows: Street lighting, $31.50 per post; private consumption, $4 per 1,000 cu. ft. The cost of plant was $26,000, $6,000 of which was a bonded indebtedness. The private consumption at this figure, after the first few months of experience by consumers, showed a falling off of revenue by the Company, and in the course of time the price of gas was reduced to $3 per 1,000 cu. ft., which made a slight increase each year in the Company's revenue.

I am not an advocate of high prices for private consumption, nor was the Company, but we had to contend with the following: The people in this country have an idea that all gas companies are bloated monopolies, and do not take into consideration that companies of small towns that have in the neighborhood of three, four, or five thousand inhabitants, have not the field to draw from that a city company has, nor do they consider that the amount of gas consumed in a small village in one year would serve a large city for but a day. And, further, expenses must be cut to the lowest point by the people and merchants in places the size of Hillsboro, as business in said towns has not been and cannot be placed on an average with larger cities. Hence the coal oil factor is a measure of economy and a detriment to gas companies.

It is said: "Put the price of gas down and more will be used." Now let us illustrate: We were selling gas at $3 per 1,000; if we put the price to $1.50 it would take twice the amount of fuel, etc., to reach the amount of income that the Company was receiving under the $3 contract. This subject was considered by the Company, and the sentiments of the people were canvassed, but no result in regard to cutting the price was reached. At the expiration of the 10-year contract, the Company made a proposition to reduce city lighting to $20 per lamp and private consumption to $2 per 1,000 cu. ft., and had a petition signed by the largest taxpayers and consumers of gas of the village, requesting the Council to make said contract. But, unfortunately, the Council and Gas Company locked horns, and this situation continued for the period of two months. The Company had $32,000 capital at stake—there being an addition to construction account of $6,000, with the bonded indebtedness paid off—and the club of an electric plant hanging over its head, as they accepted a contract of two years at $16 per lamp, with the rate of $1.50 for private consumption. We were willing to make the test in regard to increase in consumption at a lower figure, which was half of the former contract, and at the expiration of the first year our predictions that the amount of gas consumed would not be doubled were fulfilled, the same falling short of the figures of the previous year. At this reduced figure, the Company was still made the subject of complaint, whenever gas bills were presented, as being "too expensive," and "that the Company were robbers," etc. At the expiration of this contract the electric question was brought up again, no thought being given the local Gas Company's interest or investment at stake, as no contract could be reached by them with the city.

This state of affairs brought the Company around to investigate the matter of public arc lighting, with the incandescent for private use. In anticipation of supplying both gas and electricity the subject came up "What would become of the gas interests?" Lighting the streets by electricity would cause a loss to the gas revenue. Would the increased price of arc lighting overcome the gas loss, take care of the running expenses, interest, etc., and make a profit for the Company? In our figuring we found that arc lighting for the streets at the low price of $10 per light per year, and gas, used at private consumption, at $1.50 per 1,000 (taking the total amount of gas used the last year of the $1.50 contract) that the Company would come out even, not making a penny. If we undertook this addition our only salvation was in the use of incandescent lights for private use, as the only expense attached to this part of the works would be the increase of fuel, the Company having necessary steam power and employees. This, for a certain number of lights, would allow us each year to pay a small dividend after setting aside an amount towards the cost of electric plant. We decided to try the experiment, and on the 22d of last March (1889) 60 arc lights were turned on in the village. We have not had experience with the incandescent light as yet, the same not having been put in. The past year corroborates our statement that without the incandescent lights we would not be able to make a penny, as we have not. Now, I hear you say if we put in the incandescent light it will make a deficit in our private gas consumption. That is true, but with our facilities we can make incandescent lights cheaper than gas, and by utilizing employees in the gas plant with the electrical works, the amount of gas manufactured is only averaging the regular cost of production. If you could supplant all gas consumption with incandescent light at a set price per month, it would be better to do so; as, for the same amount of revenue you would receive from gas, your profits would be larger, and you would have your gas plant for fuel purposes at a cheaper rate to consumers and a cheaper process of manufacture.

Now, then, why have we let the past year go by without the addition of incandescent lights? Here we must look at this question in two lights. What is the nature of your citizens in the locality in which you reside? Are they progressive, or does the same state of affairs exist with you that we have with us—the people being conservative? If they are a wide-awake, liberal, pushing class, and have improvements in their locality at heart, the combination of gas and electricity will be a success, but if they are of a conservative order, you will know not what obstacles you will have to surmount, or at what time your investment will be put in jeopardy. We have failed to put in incandescent lights for the reason that we have been unable to secure a certain number of lights (200) at a rental of 75 cents per month (lights to burn from early candle light to 1 o'clock at night). We may be asked "Why don't you sell it by meter measure?" I will here give an illustration and then await your verdict. We were called upon by three citizens some time ago to extend our mains on a certain street. Not being compelled to make extension unless the number of 5 consumers could be obtained, and yet feeling inclined to accede, we stated to the gentlemen that if the city would take three lamp posts we would comply with their request. This the city agreed to do at $16 per lamp rental. We made our extension at the cost of $350, received 1½ year revenue from the city, while the revenue from the three consumers is as follows:

The first consumer has been using gas constantly at an average of $1.05 per month; the second never put gas in his residence, and the third consumed 15 cents in gas the last year. Now, gentlemen, here we are; what can you say? I claim that with 400 incandescent lights at a rental of 75 cents per month, contracted for, it would be an inducement for any company to install said plant; but no company under the sun wants to make an outlay under existing circumstances as given. We have our plant and must make the addition of incandescent light, and work up to a certain subscribed number of lights. We anticipate making this addition in April. Our rental to this city for public lighting is

the cheapest of any lights that I know of, taking in comparison the population we have with other places. We receive $70 per lamp for 63 lamps, and are required to burn each and every night in the year with the exception of (when it is moonlight) after midnight we are allowed to shut down. This gives us on an average of eight half nights in each month that we do not run. In addition to this we have to furnish gas lighting for the city buildings free of cost. I advocate that a corporation should be liberal in its contract with gas or electric light companies for public lighting, and the benefit given to consumers in cheap rates.

Now, to a brief history of our electric plant: The first important step we made upon the introduction of the electric light in connection with our gas plant was the attempt to thoroughly post ourselves as to the state of the art in other places in visiting other successfully operating plants. We started out with the general proposition that the best was none too good for us. We selected the Thomson-Houston system, with the Ball engine, and after operating the plant one year we have as yet to regret our selection, and have won the honorable mention of probably having one of the best, if not the very best, lights in the country.

Our city was formerly lighted with 170 gas and gasoline lamps of 16-candle power, making 2,720-candle power per night. We have now 63 2,000-candle power arc lamps, making 126,000-candle power per night.

We make it a point to reduce the number of employees and tried to get first-class labor. To do so we found it practical to secure an engineer and electrician in one person. Our labor includes one engineer and one trimmer, and we utilize the night stoker in gas plant as fireman for the electric plant. His duties are not excessive, and as soon as we get our automatic stoker in operation his duties will be comparatively light.

The claims made for the Ball engine were 4 lbs. coal per horse power per hour. Our first statement upon first starting was:

$3\frac{1}{2}$ lbs. coal per horse power per hour.
4 lbs. coke " " "
$2\frac{94}{100}$ lbs., $\frac{1}{4}$ coke and $\frac{3}{4}$ Jackson slack.

This estimate does not include steam raising. We have lost two hours time with engine, and two nights' run with one of our dynamos. We have found that it is necessary to furnish 1-horse power for each 2,000-candle power light, and possibly our system may be slightly in excess of other systems as to close power economy; but its great reliability and excellent operating success more than compensates for this slight loss of power. We use the St. Louis hydraulic $\frac{1}{2}$-inch carbons, and can count upon 9 to $9\frac{1}{2}$ hours in each carbon. Have had no accidents.

Now, as to the future: We are here and in good shape, with anticipations that our community will take hold of incandescent lighting, to no disadvantage to our private gas consumption; as it is known the country over that where one place of business is well lighted the next door neighbor must have a better light, either with gas or electricity, and thus we hope to increase either one or the other of our modes of lighting.

In regard to the people of smaller towns, it generally takes some time to get them interested in any matter of this kind; but we intend to treat them liberally, and hope by next year to give a successful account of a paying investment of the arc and incandescent addition to gas which makes a success of "Combination of Gas and Electricity in a Small Town."

Discussion.

The President—Gentlemen, this paper is, I may say, a matter of interest to all of us—perhaps of more interest to some than to others. As the author is not present, there may be a little inconvenience in discussing it, but I trust that all will discuss the paper with the utmost freedom.

Mr. Penn—I have had some experience with a combination of gas and electricity in the little town of Washington Court House. Our population is about twice that of Hillsboro. I do not know I can say anything that will add to what Mr. Bowers has said, but in regard to incandescent lighting, especially at the prices they have agreed to furnish it at in Hillsboro, I will say this: Our citizens come at me in this way—we get $80 for a 1,200-candle power arc lamp, while they only get $70 for a 2,000-candle power lamp—and say, "Why don't you furnish it as cheap as Hillsboro?" I say, "We don't have to." In Hillsboro some of the parent companies came in, got hold of the Council and treated them nicely, nicer than our gas men can afford to do, got up a fight for a franchise, and forced the Gas Company into buying an electric light plant at an unreasonable price. I thought, when that paper was being read, if there was not some way by which this Association could come to the assistance of the small gas companies when these parent companies come in and force them into buying a plant. They could certainly give them some assistance in the way of advice, if nothing more. We were more fortunately situated than they were in Hillsboro. When we took hold of the matter I got our contract to run to '95. We put in an electric light plant simply because the people wanted it, and it was going to come anyhow. Another thing, we were enterprising. We wanted the town to boom, and we concluded to put in an electric light plant. Our gas plant was about up to its limits—it is a small works, with only 4-inch connections—and we felt that we had gone so far that we would either have to put in a larger gas plant or add an electric one. Taking all these things into consideration, we thought it advisable to put in electric light. We finished our addition last month when we put in a second machine. Of course I can't give any data as to what we are making. I made a rough estimate of what coke was required—I am using coke altogether—and I think it is as cheap, or cheaper than coal. My impression is that we will make a very good percentage on our investment; but, on the other hand, on the gas part of it, I find we are a little bit short. It is going to "hustle" us, as the saying is, to keep up the improvements for the gas required. Now we have a demand for an extension of mains. That thing is staring us in the face, and we are not getting anything from the city to amount to anything (only about $1,000 a year), and, of course, that is not going to give us much revenue from the city contract. The private consumption will hardly pay all the running expenses and give us surplus enough to enable us to extend our mains as they should be. Now, of course, as has been stated before, the electric light no doubt increases the demand for gas light, and it is a benefit that way. I can state several cases in our town where parties who were using oil saw, as soon as we got electric lighting in, that there was such a contrast between it and oil that it made them sick to look at their light, and they ordered either electric light or gas. I have one case in mind where a bookstore was equipped with electric light. The next store was a boot and shoe store, the proprietor of which was a very close man, who watched dollars and cents very closely. I had been at him nearly two years to put in gas, but he adhered to the use of oil. He said gas was too expensive and he couldn't stand it; but as soon as the bookstore put in electric light, he came to me voluntarily and said he wanted me to put gas in his store. I did so, and he is a good customer. In several places where we put arc lights in the stores they have abandoned oil altogether. Another place in point was a clothing store, in a long deep room, with low ceiling—a very dark place; they used oil, all except the two front windows. Of course they wanted the people to know that they burned gas there. Their gas bill didn't amount to anything. I would a good deal rather have had their meter than to have had their trade. I put in arc lighting there and they said "Oil don't look well beside electric light, and we would like you to fix up gas burners for us." Now, next door there was a tailoring establishment, and, by-the-way, the proprietor is one of the stockholders in the Gas Company. He put in arc light. He was always a little bit on the kicking order about his gas bill—thought he didn't get enough gas for the amount of money, although he was a stockholder. I noticed since putting in the arc light that he burns two jets in the window and one back at the desk. I intended to have brought a paper showing comparisons in the case of these parties, but in my hurry at starting off left it. I could show you the names and the amount of gas used before they put in electric light, and the amount used since. Of course there are exceptions. This book store that I spoke about don't use any gas at all. They have a very high ceiling and one light lights up the whole store, except in the holidays, when they light the back part of the store with gas. We keep meters in all these places and give them the regular rate, whether they use little or much.

Mr. Booth—I believe Mr. Penn has gone pretty thoroughly over all the ground. He has had a little more experience than I have. We went into the electric light business in November, and put in two 35 light (2,000 candle power) T. & H. machines. We did it as a matter of policy. Other parties were making application for a franchise, and our contract for lighting the city ran out the first of last May. We decided if they came in it would cause a fight, and we determined to put in a plant of our own. We induced the Council to give us a franchise first—that we should have the first right on the streets. We started our plant up about the 1st of December. The first contract was for 36 arc lights. We get $90 per year for all night lighting, except three nights in the month, at full moon, and since they were put up we have had an addition of eleven, or a total of 47 lights. We have only seven commercial lights. We have not been soliciting for commercial light at all. Of course if any person comes to us and wants a commercial arc we put it in. We have been at a loss to know whether it is policy or not—whether there is not more money for us in gas than electric lighting. I notice where we have put it in has been altogether in saloons. Our saloons are perhaps the best consumers we have, consuming from 5,000 to 15,000 feet a month of gas. They burn gas in addition and we

get about the same amount from arc light and gas together that we did for the gas. There is very little difference in the amount of their bills. The arc just takes off about the same proportion of gas as if they had burned all gas, and we get about the same money per month from our customers that we got before we put in the arc lamp. We can get coal pretty cheap down there, and we get $1.20 for gas, net. Of course we have not run long enough to determine whether we can make any more out of it than we did out of gas. From the city for gas we only got $15 per post. Our revenue from that with the number of posts we had, amounted to about $2,300 a year, while we get now (with the 47 lights) $4,200 for the electric light, which I think ought to give us a little profit. We started up in November, and we didn't get anything from the city till the 1st of December, when they commenced to pay us for the arc lights. We started up the 20th of November to run the lights, but we only charged for the gas rate to the first of December. From the 20th of November I figured to the 1st of January—a month and ten days—and we had a little margin in that length of time over the cost of running. Of course, that was a fair estimate. Our expenses were larger than they would be now. We had to get accustomed to the business. We are talking some of putting in the incandescent light, because the people want it. They have it around there, and our people say, "Why don't you put it in? You have a monopoly and you think no person will come in, and you won't give us the incandescent lighting." It has been our object to please our consumers, and, if possible, to give them what they want. We expect this summer to put in an incandescent lamp machine, and we think, if we can go over the river to Benwood, we can get enough to pay us to put in the plant, as they have no gas there. I am satisfied that when they try incandescent lighting at the price it is sold at now they will find it more expensive than gas, and I expect there will be more "kicking." We have some people of that sort, of course, in our town, like they have in other places. I was amused at Mr. Penn's statement about one of the stockholders "kicking on his bill." It put me in mind of some of our consumers who act in the same way. In regard to incandescent lighting, it is a question with us whether it is policy or not to put in a plant. I will say that our consumption has been greatly increased in the last year—say, by three million feet. Our meter sale to private consumers would run in the neighborhood of a little over ten millions. We lost somewhat on account of natural gas. A few of them put in the Lungren burner, and we have never been able to get them back. They were some of the best consumers we had, but they wanted cheaper light. Natural gas is very nearly played out. In a cold day there isn't enough there, but in the warm weather we have a pretty good supply. This winter, being open and warm, we have had enough gas for general purposes, except on the real cold days when we had to hunt up wood or coal to keep warm. If it had been a cold winter I don't think there would be much gas used in Bellaire now. Most of the factories there have been thrown out of natural gas, although a few of them use it yet. Only two of the glass factories I believe use it for melting. It is pretty nearly played out, and I understood the other day that the Natural Gas Company in Martin's Ferry had instructed their agent to make no new contracts with new consumers, either for lighting or heating purposes, as they thought they had about all they could take care of. I would like to hear from somebody who has had experience in regard to incandescent lighting, where there are gas companies, to give us that experience.

Mr. Wilkiemeyer—My remarks will be based on the teachings of observation, and not experience. At Portsmouth, O., we are entering the electric lighting field, and I must confess I feel a decided shakiness about the knees. The Directors of the Portsmouth Company placed at my disposal a certain amount of money for traveling expenses, etc. My instructions were, "Investigate the different systems of electric lighting and steam engines." One result I have achieved—their money I spent. I studied the different makes of engines, their utility, economy, and efficiency; and when near my journey's end—as yet not having arrived at any satisfactory conclusion—I visited Raleigh, N. C. There I found two Otto gas engines, 50-horse power each, speeding three 45-light dynamos. I had been told that gas engines would not give the steady power necessary; but the light was steady, and, I thought, superior to any I had seen in my travels. Incandescent lamps were fed from the same circuit, and only by very close observation could I see an occasional waver, which would not be taken note of by a person not intent upon discovering this defect. Credit should be given this Company—as I understand the case—for the enterprise displayed and their results. At the time they installed the electrical plant a 50-horse power Otto gas engine could not be had in this country. Nothing daunted, they imported one from London, England. Each engine is taking but 17 cubic feet of gas per horse power. At Portsmouth we are following the footsteps of Raleigh (N. C.), Spencer (Mass.), and Norwalk (Conn.), by utilizing a gas engine—furnishing electric light, and still selling gas through the medium of the electric light. I expect to do this—operate 7 hours per night, and with the following most liberal figures attain the consequent results. Our engine is a 50-horse power Otto gas engine. Now, then, supposing it will require 20 cubic feet per hour per horse power, we have a consumption of 1,000 cubic feet each hour; for 7 hours, 7,000 cubic feet. We will need to charge, say, 5 extra retorts, taking a total of 1,560 pounds.

1,560 pounds of coal = 19½ bush., at 5½ cents		$1 03
Cost of labor of charging the 5 retorts		35
Total		$1 38
We will have returned in residuals—		
9 galls. tar, at 7 cents	$0 63	
10 bush. coke, at 5 cents	50	
		1 13
Total cost of fuel for the 7 hours' run		$0 25

That electric lighting plants, to be a commercial success, need most careful watching and closest economy is evidenced from the following item; furthermore the market value of stock is its true value. The item is from a recent issue of the *Cincinnati Enquirer*, and reads as follows:

"*Novel Auction Sale! Some parties Dumping Electric Light Stock, and others Taking it in.*—A sale of electric light stocks and rights was held at auction yesterday at the Bodman Tobacco Warehouse that attracted considerable attention from the novelties that were offered and from a certain story that was in circulation. It was stated that the gas companies had suffered from the establishment of electric light plants, and now that the former were getting the best of the latter, probably by buying them out. It appears that there is an organization called The Ohio Edison Installation Company, so called because it has the right to install Edison electric light plants in the cities of Ohio. Some that it has established had to be sold out. The reason given for having the sale at the tobacco warehouse was because so many tobacco men were interested. The sales were $74,500 Middletown (Ohio) Electric Light Company stock, 6 cents on the dollar; $10,600 Tiffin (Ohio) Electric Illuminating Company stock, at 60 cents on the dollar; $16,000 Piqua (Ohio) Electric Illuminating Company stock, at 23 cents on the dollar; and $10,000 Circleville (Ohio) Electric Light Company second mortgage bonds, at 15½ cents on the dollar. There was offered $8,000 of the stock of the latter Company that is in litigation, but there wasn't a bid on it.

"Besides the sale mentioned the Installation Company sold its entire rights in the Middletown Company for $25, in the Piqua Company for $35, and in the Tiffin Company for $125.

"There were in attendance at the sale Messrs. H. H. Hoffman, Henry Worthington, J. Hamilton, E. C. Williams, Judge Harmon, J. O. Wiggins, H. R. Morehead, and many others."

I happen to know of the experience of Circleville. They made an investment in an incandescent electric light plant of $55,000, and it was sold at receiver's sale for $17,000. That seems to be an experience well worth looking at by gas companies. At Circleville they are now thinking of putting in an arc plant. The stockholders of the electric light company there have control of the Gas Company—I think they paid $40,000 for the stock. Now that, with the $55,000 that they have invested, makes $95,000. With the arc light coming in there—the town has a population of about 6,000—what are they going to do?

Mr. Gwynn—They will go up.

Mr. Wilkiemeyer—Another thought comes from the reading of Mr. Bower's paper. Do not we, as gas men, make a mistake in cutting our prices under compulsion? Ought we not to make these prices before we are compelled to make them, and thereby gain the friendship of the people we are dealing with? When we fight we don't want to be beaten—neither party wants to be beaten. It creates bad feeling that is very hard to overcome, and I think that is where a mistake is made. If we economize as much as we can, working hard and doing all that we can to please the people, and giving them gas at the lowest price that we can possibly give it to them at, the people will not be unreasonable, and they will stay with you, and when the electric light company comes in they won't get anything from them. The Gas Company, of course, must have foresight enough to know that if electric light is wanted in that town, they must give it to them; but if you don't give it to them, and another company comes in there, don't run.

Mr. Booth—One remark made by Mr. Wilkiemeyer in regard to the cutting of the price of gas I favor very much. Our experience in that line was that in 1884 we made a contract with the city to furnish gas at

$1.50 per 1,000, net, to city and private consumers. When natural gas came in two years later we voluntarily cut the price to $1, although our contract with the city for $1.50 lasted three years longer. When the natural gas failed so that it had to be abandoned, we advanced the price to $1.20. There was no "kicking." We had a contract with them for coal gas at $1.50, and they expected to pay $1.50, but instead of that we only advanced it 20 per cent. and put it at $1.20. I think it is a good plan for a gas company, whenever they find it is necessary to make a reduction, to make it without being forced, and thus get into the good graces of the consumers who won't think you are trying to take advantage of them all the time. I think it is a good plan to do things without being compelled to do them.

A vote of thanks was passed to Mr. Bowers for his paper.

The meeting then adjourned until 2 o'clock P.M.

FIRST DAY—AFTERNOON SESSION.

The Secretary—We have a telegram from Mr. J. M. Bate, who was to have read a paper here on "Theory and Practice in Gas Management," but who is unable to be present. His telegram reads as follows:

"Comrades of the Ohio Association:—Theory in gas management is a delusion. It is all hard practice. I am proving it by trying to engineer a gas lighting contract against an electric and gasoline combination. If any of you know how to pray, make a silent petition for me in this time of woe. Am sorry not to meet with you, but my spirit is there. Wishing you a successful meeting and a good time, I am yours, fraternally—John M. Bate."

We also have a telegram from Capt. Wm. Henry White, of New York, as follows:

"Accept my sincere wishes for a large and interesting meeting, and my regrets that I am compelled to be among the missing.—Wm. Henry White."

At this point Mr. Chas. R. Faben, Jr., read his paper, entitled—

GRADUATED VS. UNIFORM RATES.

The subject presented in this paper is one that has interested, at different times, many of the general managers of gas companies throughout the whole world. It has been the subject of discussion among them during conversation, and also in open convention at the meetings of many of the largest gas associations.

There are those who argue strongly in favor of a "uniform rate" to all consumers, large and small, for any and all uses and purposes to which gas can be applied, while others again have presented equally strong argument in favor of "graduated rates"—the amount of gas demanded, the time of day in which the gas was likely to be consumed, and the purpose for which it was to be used, being a governing factor in the rate per 1,000 cubic feet to be charged for such gas consumed, etc.; and yet we are almost without precedent and reliable data to govern our actions, should any one of the gas companies represented here to-day desire to engage in the practice of "graduated selling rates."

It is true, nearly every gas company operating to-day does make some comparatively small concessions in the lines indicated. Some companies make a lower rate, if a certain large quantity of gas be consumed in a given time, irrespective of the purpose for which it is used; others again make a special discount upon bills for gas consumed for heat and power purposes, irrespective of quantity used; and nearly every company makes a discount for prompt payment of bills, some of them being very liberal in this regard. Some have made great effort to introduce into common use gas stoves for cooking purposes, selling stoves at or below actual cost, renting stoves, etc., yet no company of my acquaintance has adopted the broad policy that the time and hour seems to demand.

Great inroads have been made upon the gas lighting business of the cities and towns of our country by the advent of the arc and incandescent electric light. Some of the managers of gas companies obtain all the comfort and solace they require when they state that the arc light has educated the community to demand more light, with the result that their output of gas is just as great, or that they have experienced a slight increase over the preceding year, etc. But this, I say, is not enough. Why should we stand comparatively still, while our competitors in the lighting business push forward, and are enabled to show a very large increase of lighting business in the same territory that we, as lighting companies, have so long occupied?

The earning capacity of the plant, and of the capital at present invested, should be largely increased, since the lighting business has been very largely increased, as clearly indicated by the amount of lighting that is being done at present, electrically.

If electric light companies offer a light that answers the purpose better than gas, then we must look for another market for our product. If, to secure business, they make generous concessions to very large consumers of light, then, if we can afford to do so, we also should be prepared to make like concessions and secure the business. If a large and profitable increase of business is not to be secured to us in the field of lighting, then is not the fuel and power field the one for us to occupy? And is not the present the time for us to make the necessary move to secure the same?

As previously stated, we are almost without precedent and reliable data to govern our actions, should any of the companies represented here to day desire to make a new departure, adopt a broad and liberal policy, and occupy the field as a "Lighting, Fuel and Power Company." From a newspaper of recent date I clip the following items:

"*Relative Cost of Producing and Distributing Fuel Gas.*—At a recent meeting of the Engineers' Club, of St. Louis, Mo., Mr. Emerson McMillin, President of the American Gas Light Association, and of the Laclede Gas Light Company, of that city, expressed his intention of endeavoring to solve the fuel gas question in St. Louis, in the near future, by making and distributing it from an existing plant in that city, and if the people supported the enterprise it would be continued and extended.

"Replying to the question as to the relative cost of manufacture and distribution, Mr. McMillin stated that in an extreme case which had come under his observation the distribution cost four times as much as the original cost of gas. In well designed and equipped works these items of expense should be about equal. The European practice was to estimate that one-third of the selling price of gas should pay the interest on the investment, one third the cost of manufacture, and one-third the cost of distribution. He called particular attention to the fact that mains used for distributing fuel gas could be used for probably 15 hours of the 24, while those used for illuminating gas were used probably 3 hours. The fixed charges, therefore, per thousand cubic feet of gas delivered, would be greatly reduced."

"*Fuel Gas in Kansas City.*—That gas will be manufactured especially for fuel purposes in Kansas City before the close of the present year is confidently expected. With all other modern conveniences in this age of advancement, the old-style way of using wood for heating and cooking is behind the times, and fuel gas seems to be destined to take the place of these bulky commodities to a very large extent. 'The Kansas City Gas Light Company's new gasholder, at the corner of Twenty fifth and State Line streets, with a capacity of 1,000,000 cubic feet, is nearly ready for business,' said one of their officials recently. One of the purposes of the Company is, as soon as practicable, to manufacture gas for fuel.

"Officers of the Company believe that the time is not remote when they will feel justified in beginning the manufacture of a fuel gas which may be supplied to consumers at a cost not exceeding 75 cents per 1,000 cubic feet. The initial outlay for such an undertaking, including the cost of about 20 miles of mains to be laid in the thickly populated residence districts, would approximate $200,000; but it is not unlikely that such a task may be begun before the end of 1890."

These two items are only a sample of many that are constantly before us, and they clearly indicate the great field that is open to us, if we will but make the proper effort to enter and occupy it—not in a small way, as if by experiment, but in the broadest sense of the term. We occasionally come across such a news item as the following: "*Fuel Gas at Montgomery, Ala.*—The Montgomery Light Company have a daily output of gas of 100,000 cubic feet, of which 40,000 cubic feet is sold for fuel purposes. They charge $2 for illuminating and $1.20 for fuel uses. Twenty (20) heating and 108 coking stoves and four engines are now supplied. The gas stove trade is handled by the Company, and stoves are sold at cost. They examine the stoves regularly, and have a rapidly growing stove trade. The monthly consumption of gas per stove, they find, averages 3,600 feet. They think of trying the rental plan this season."

Here we have the case of comparatively a small gas company who have given the matter some considerable thought and attention, and have decided to try an experiment, to wit, making a discount of 40 per cent. from price list to all persons who will adopt gas as a source of heat and power. No doubt there are many such cases in actual successful operation in the United States, but yet we have no compilation of these facts, and we are without data as to practical working results, and, therefore, are without the means to make deductions to govern our own particular case, should we decide to do so, but we must also resort to another "experiment."

The importance of having this sort of data properly compiled, together with the peculiar local conditions existing where the "experiment" is made, must be apparent to all; but how to collect this data, and in what form to present the same to existing gas light companies

in a clear, intelligible manner, so as to enable them to make a satisfactory "schedule" for their respective localities, I am unable to present in this paper.

Gas light companies would be justified in their action were they to make special rates for gas used for special purposes. Railroad companies make special rates on classification of goods carried. When sulphate of ammonia is shipped to a buyer, the rate is, say 40 cents per 100 pounds; but when the same material, in the same packages, in the same car, is shipped to the same buyer, and he intends to use the material as "fertilizer," the freight rate is only 20 cents per 100 pounds. If the experience, practice and business laws governing in the case of railroads, is good, why will not the same apply equally well with gas light companies, who are forced to depend upon purely local trade for patronage and support?

The saying that "large bodies move slowly" is applicable to the general policy exhibited by many of the gas light companies in their past history. We are sometimes told that the present generation of gas makers are living down the sins committed by their predecessors in the business.

This leads us to the question, Are we not, as the progressive gasmakers of the present committing sins that will entitle future generations of gasmakers to truly say of us that they also are living down the sins committed by us? A look at the past will convince most of us that we have sometimes blundered and committed great errors; that our prejudice was much stronger than we are willing even now to acknowledge.

Just review, to a moderate extent, the subject of "Water Gas." When the "Lowe Apparatus" was first presented to the notice of the average legitimate coal gas man, what was said of it? We said, "It is nothing new. It don't amount to anything." Prejudice was our master at the time.

We did not say to Mr. Lowe that the apparatus presented was crude, and that it simply needed to be improved by better proportioning its parts, and in some other small matters of detail. We said that it was no good, and that settled it. But Mr. Lowe and others, not acknowledged as great gas men at the time, thought differently, and they worked and labored upon "water gas apparatus" until they have produced systems that many of the former legitimate coal gas men have since adopted, and they now swear by carbureted water gas as against their original idol, coal gas. The present direct water gas apparatus produces the same volume of carbonic oxide that it used to produce, and carbonic oxide is just as poisonous as ever, but with more calm reasoning, and dismissing our prejudices, we can now see that the presence of carbonic oxide in our gas is not seriously objectionable, but is in a measure desirable as an ingredient in an illuminating gas.

The subject of electric light was also treated by gas companies generally with the same sort of biased reasoning. It was pronounced as being simply "A demonstration of a scientific principle," "The light for the rich," etc. To-day we are confronted with the propositions of the so-called "fuel gas company projects." They are not entertained by the existing gas light companies, any more than were the "water gas people" of a few years ago, and as they (the promoters) have faith in the "fuel gas business" (with the matter of light as a sort of a side issue), they are forced to apply for a separate franchise, if they desire to engage in business at all. I do not say these things as an indorsement of their processes nor their methods and practices, but simply to raise the question, Are we to-day repeating the same sort of a mistake that we did a few years ago upon the subject of "water gas?" If we are, then we should at once proceed to change position, and not again wittingly place ourselves on the wrong side of a very important subject.

The more common use of gas for fuel and power purposes is near at hand, but if the narrow policy that has been the practice of the average gas light company in the past, is to be continued as the true policy for future operation, then fuel gas companies yet to be formed, will be the ones to do that business, but if existing gas light companies will adopt a broad and liberal policy, incorporating some schedule of "graduated rates," the price charged per 1,000 cubic feet of gas to be based, in a measure, upon the value of the service rendered the consumer, then existing gas light companies will be the ones to do the business, and in this manner largely increase the earning capacity of the present investment.

Discussion.

The President—Gentlemen, probably there is no subject that has been presented here that has commanded more thought or been more widely discussed in the past than this very question, and I trust we shall have a warm and earnest discussion that shall be fully as valuable to us as the reading of the paper has been. If I be permitted, I will ask Mr. Hyde to say something to us that shall reflect his views and opinions.

Mr. Hyde—In a city of the size of Cleveland, as a principle I think there should be one price in the ordinary use of gas; but as this paper indicates we should be looking to the future. We should not let time pass, and not take advantage of the privileges and opportunities that present themselves. The question of fuel gas has been brought before the various Associations, and has been discussed in the GAS JOURNALS, and whether we are to have a special gas fuel or to use the present illuminating gas or fuel, has been discussed somewhat. It seems to me that with our present coal illuminating gas plants, and with all the conveniences for manufacturing and distributing gas, we should take advantage of the means we have and deliver to our customers fuel gas. That, of course, necessitates having two prices for the gas. Now we are very well aware that as the prices of gas have been reduced from time to time the consumption has been largely increased. It would seem to me that a desirable way would be to have two prices for the illuminating gas, one for that used as fuel and the other for that used for illuminating purposes. The ordinary price for illuminating gas is too high for that same gas to be used for heating purposes to any great extent; and while we have the means and opportunities of making and distributing gas, if the consumption chould be largely increased for the day-time, the outlay would be increased simply in the labor attending the manufacture of the gas at the works. Now I think a policy will have to be, or should be, adopted by gas companies to meet this desire to have fuel gas, by fixing the rate of all gas used for fuel purposes much lower than it is for illuminating purposes. What that should be—how low it should be—is a matter that will have to be considered and discussed before the rate will be fixed. We all know that since the use of gas for cooking purposes the send-out for the day is largely increased. In our city the increase has been quite extensive, and I feel sure that should the price be reduced largely the gas will be used for other purposes than simply for cooking. I suppose for the heating of houses, the amount is comparatively small, but I think, with the rate reduced to say perhaps half or two-thirds, and then attention given to the construction of heating furnaces, the day may be not far distant when our houses may be heated by our illuminating gas. We have the pipes and meters in the houses and a very small outlay would be required to attach it to the furnace, or to a furnace which may be designed for that purpose. Of course the ordinary coal furnace is not adapted to the consumption of gas with economy, as it could be by some study and experimenting which the ingenious gas men of the present day are putting on that subject. My opinion is gas men should give thought and attention to this matter, and the probability is only a short time will elapse until the consumption in the day-time will be equal to the consumption at night.

Mr. Penn—I am much interested in this question. I have for about three months been contemplating making a reduction in price, and have been waiting until this meeting so that I could hear the question fully discussed, as I am in hopes it will be. I have been thinking the proper way would be to make a uniform rate for illuminating gas to all consumers, both large and small, and a uniform reduced rate for all fuel purposes. I would like to hear the opinion of others before I adopt that schedule.

Mr. Tayler—I think the question of graduated prices is very largely a local question. In some places it would be exactly the thing, in others it would not. I am speaking of graduated prices for illuminating purposes. In my town (Warren) we have no large consumers. There are none large enough to make it any special object to reduce the price of gas to them—that is, to make a graduated rate; but I think the only way to use illuminating gas for fuel purposes is by reducing the price. For the last month or so I have been heating my office with gas in a new way, putting in pipes and heating by hot water—putting gas under my boiler; and while it is a very convenient way of heating, and one that perhaps a gas company could afford to use for its own heating, it would stagger some of our customers if the bill were presented to them. I find it takes about 1,500 feet a day to heat my office and shop. That, at any price that we could sell gas at in Warren, would not bring many customers. But if the price of gas could be put at something that approximated the price of coal, we could furnish gas for heating purposes. The question with me is—how to get down there. I don't see how we can make a coal gas in a town of our size at anything near the cost of hard fuel—without it would be a change in process, making an entirely different gas, and that means almost another gas works.

The Secretary—One of our consumers at Columbus said that he would agree to let us heat his house with our gas, by putting it under a boiler, as in Mr. Tayler's case, and heating the house with steam. He would agree to let us undertake it and allow it to re-

main there, if it did not cost him more than twice as much as coal. We made the experiment, using two or three kinds of home-made atmospheric burners under his boiler. Experiments were made to a considerable extent, and yet we could not come within the limit that we had fixed. It cost more than twice as much as coal.

A Member—At what price?

The Secretary—One dollar a thousand.

Mr. Christian—I would like to know whether Mr. Tayler used hot water circulation or steam?

Mr. Tayler—Hot water.

Mr. Christian—For how many hours?

Mr. Tayler—Twenty-four.

Mr. Christian—That is very favorable towards gas. I did not think it could be done for that. What sized rooms are those?

Mr. Tayler—Two rooms about 16 feet square. The shop is about 24 by 16, and hall-way is equal to a room 16 by 18.

Mr. Christian—Last Spring I went to Iowa to change a plant that had been making hydrogen gas—it was a town of about 12,000 inhabitants—and I don't think they had been using it more than a year. It was an illuminating plant, not one for fuel purposes. They used the Springer apparatus and made the hydrogen gas with the Springer cupola. They used hard coal, costing, I think, $8 per ton. All the coal that we used after I went there they had when I went there. We changed from an oil process. They sold their gas at 60 cents a thousand feet and that winter they lighted a large hall with some of their burners. The expense, I think, with the gas at 60 cents, was about three times the cost with lighting with coal gas. Of course the soft coal was cheap. You could get coal at $1.35 a ton, delivered, so that hydrogen gas at 60 cents in that town never could have competed with soft coal.

Mr. Evans—Mr. President, the subject has somewhat taken a fuel gas turn, and I may have a word to say. I don't think that fuel gas, as manufactured even at the lowest possible price to-day, can be used to heat an office by steam. Of course it is evident that to produce it you have to raise the temperature to the boiling point, or 212°, and that in the changing of that water from the boiling point of 212 steam it will equal a latent heat of 966°. So that in changing water into the form of steam you require a great deal of heat, and also pass the products of combustion out of your chimney at a high temperature, at least as high as that of your steam. So that as fuel gas is produced, or any other gas, I don't think that we to-day can compete with coal in this way. I would like to ask Mr. Faben if he is using graduated rates, or is making any attempts in that direction?

Mr. Faben—No, we are not. I said to the Secretary at the time it was in bad taste for me to write a paper indorsing some pet principle of his that I did not have in practice. But I think we should be excused a little as we are well supplied with natural gas. It would be senseless for us to attempt to do a fuel business, because you can buy natural gas for 12 cents a thousand, meter measure. The subject was an entirely new one to me, suggested by our Secretary, but in thinking the matter over the more important the whole subject seemed to be; and without making a very exhaustive and tiresome paper I hardly knew how far to go with it. One of the most important things that presented itself to my mind in the preparation of the paper was the lack of data as to the experience and experiments that are going on all over our country. Occasionally a newspaper will take it upon itself to send out a list of questions, asking the companies to kindly fill in the blanks. They will ask them how much of their gas is burned in day-time and how much at night, what portion of it is used for fuel, and what portion for light, and what portion for steam engines. Well, it is one of those matters that they have not given any particular attention to, or kept any account of, and the result is, as my friend here says, they keep their postage stamps. If some manner or mode was suggested whereby the data covering the experience of all those companies making these experiments in graduated rates could be compiled and published, so that every man could make his own deductions for his own particular case, it would be a good thing. There is a figure somewhere lower than the ordinary selling rates that could be adopted for fuel purposes. The best avenue I see presented now is through the eleventh census. We will see, for the first time, electrical statistics. The electricians are thoroughly alive to the importance of this matter in connection with their business. Ten years ago they were not in the business, and no data were required at that time. But the commercial growth of their business demands that they have a full and exhaustive compilation of the present condition of the electrical industry. We were in the business of gas making more than ten years ago, and the kind of information compiled and in store to-day on the condition of the gas business ten years ago, at the time of the collection of the last census, is very poor material—for what reason I cannot say, but another census is about to be taken. Now, if our business had been properly canvassed ten years ago, and we knew the condition we were in at that time, both in the matter of light and fuel service, we would know just exactly where we stand on the question to-day—not only as lighting companies, but how far we have progressed with the fuel business. The trouble has been that the majority of companies have not kept a very exhaustive record of what they were doing, and when a circular is sent out to them they cannot well fill it. I would like to impress on the minds of the members that each individual can make a very much closer *guess* in his community, than can the gentleman who sends the circular out; and if, in collecting the material for the eleventh census—the schedules sent out are rather exhaustive—if each man will fill in the answers that are required, to the best of his ability, and those that he cannot give accurately, if he will write after them, "approximate," and any other data that might suggest itself to his mind, it would enable the census collector, at some later date, in his newer and later schedules, to incorporate those features.

The Secretary—Coming back to the subject of graduated rates, I would like to ask Mr. Faben if he would recommend that a company should fix a graduated rate based simply on the amount of consumption, leaving out of question the fuel part of the business?

Mr. Faben—I hardly understand the question, Mr. Secretary.

The Secretary—Would you give a lower rate to the man who burned 10,000 feet of gas than you would than to the man who burned only 1,000 feet, for illumination?

Mr. Faben—That certainly is in line with the modern practice of doing business. We have, as lighting companies, a well-organized and formidable competitor in the matter of electric lighting. Some of our members feel that incandesent lighting is still an experiment. I don't think so. I think the incandescent light will do a very large percentage of the nice lighting of the future; and I also believe that gas will be more commonly used than it was ever used before; but I don't think that we ought to content ourselves in doing just as much business as we did last year when the field is open to us to do a great deal more business. The fixed charges on a plant are the same, whether we send out one hundred million, or whether we send out two hundred million, provided that other hundred million is in a new field, and furnished during hours when our mains are now comparatively idle.

Mr. Prichard—We have used a graduated rate at Ironton for four years, and have had no reason to change or go back.

Mr. Printz—We at Zanesville have not what you would probably term graduated rates. We have a fixed charge of $1.25 per thousand feet for gas consumed for all purposes. But we allow a discount of five per cent. on bills of $25 per month, and ten per cent. on bills of $50 and over. We have not made any graduated rate for fuel and for illuminating purposes. We thought if we made two rates that it would require, in a house where they were using gas for fuel and illumination, two meters. That would be an expense we didn't think we ought to incur. Again, we hardly thought it fair to allow a man a low rate for gas consumed for fuel. For instance, he consumed say $5 worth in a month, and another man would consume twice that amount for illuminating purposes in the daytime. It is a question we thought of a great deal, and we settled in our minds the better way was to charge as low a rate as possible for all purposes. Mr. Tayler's idea of heating his office, and the figures he has stated, brought to my mind the fact that we have been heating our office at home. It is a room 17 ft. by 26 ft., and about an 11 foot ceiling. We heated it with a large reflector stove and the gas bill for six months, for heating and illuminating purposes, amounted to $40. Although we paid the year before $30 for steam heating purposes alone, we felt that we were really saving money by heating our office with our own gas. Quite a number of our people are using our gas for fuel purposes in a small way, for heating bath rooms or bed rooms, which they use just for a short time in the evening; and we have, all told—that is for heating and cooking purposes—some 400 stoves in use in our place, and the people are very well satisfied with the price we charge them, $1.25 per 1000.

The President—If I may be permitted I would like to express just a thought here. All this is exceedingly interesting, but after all, the absolute cost developed into heat units is the thing that underlies the whole matter. I have given some attention to that thing, and I regret exceedingly that I have not brought the data with me. A stove designed for heating purposes alone was brought to my notice, and I placed it in a room some time ago, and kept a record of the gas consumed, and the temperatures. This room is say 18x26, and perhaps 10 feet high. It is an outside room, that is, all sides exposed, practically, to the open air, and is in a brick building. There are nine windows and an exterior side door so that it is a fairly exposed room. Of course this is not definite, but I give you these facts that you may form your own judgment. I was really quite surprised at the measure of economy that was manifested. It was more expensive than coal, perhaps, applied in an open grate, and certainly more expensive than steam or hot water circulation, but not so vastly out of reach as that we might not take to ourselves a little courage that there is a field for manufactured gas heating in the future.

Mr. Faben—Mr. President, Mr. Evans has had some experience with graduated rates, as I recollect it. I believe they sell fuel gas at 30 cents, and add about 33 per cent. for the same gas used for lighting purposes. He might tell us something of his experience in that line.

Mr. Evans—Mr. Faben is a little in error. We do use some graduated rates, simply to this extent: The consumer is obliged to burn 5000 feet of gas per month in order to get the lowest rates. It is billed to the consumers at 50 cents per thousand, if they burn under 5000 feet, with a rebate of 10 cents if paid on or before the 10th of the month. Over 5000 feet is billed to them at 40 cents a thousand, with a rebate of 10 cents, if paid on or before the 10th. We make no distinction between lighting and heating, although we contemplate doing this on our illuminating gas main that does not parallel our water gas. We have discussed this very point, and I was very much interested when I learned this subject was coming up, because it is one which I think has brought about a great deal of thought and study on the part of gas men, and I have yet to see the solution of it.

Mr. Tayler—I would like to ask Mr. Evans his opinion as to the practicability of using gas for heating by hot air or hot water circulation. In either case I imagine it is cheaper than steam.

Mr. Evans—I imagine that heating by hot air or hot water would be the best method, as you can send the product of combustion out at almost as low a temperature as the temperature of the room. The necessity exists of extracting all the heat, so that the products of combustion will leave the room at as low a temperature as possible. A great deal depends upon the application. If you can apply it to heating by hot water, so as to absorb all that heat, so that when it reaches the point of exit the temperature is low, and yet not so saturated with the products of combustion that it will condense at that point and stop your draft, then you have accomplished all that can be done. Of course, in my paper on fuel gas this thing will probably come up again, as I have gone into the matter, not very deeply, but as much as my time will permit. I will probably have something to say on that point when the subject comes up for discussion.

Mr. Faben—On the matter of data, I believe we have with us Mr. Graeff, who has been selected as the person to collect data of the gas industry. I would like to have Mr. Graeff, if he will, tell the Association what has been done in that direction and what he would like the Association to do to assist him in the collection of statistics.

The President—I think the Association would be glad to hear from Mr. Graeff, and co-operate with him as far as they can.

Mr. Graeff—Mr. President and gentlemen: So far as the first part of Mr. Faben's remarks is concerned—as to what has been done towards the collection of the statistics—I would simply say "nothing," except getting the schedules in order; because the data has to be collected, in the gas industries, for the year ending June 30th, and of course the schedules will not be sent out until the close of June. The preliminary schedule, which will be sent out prior to that time, for information upon which the other schedules will be partly based, will simply have in it a reference to the number of gas stoves and gas engines in the town, if they can be correctly or approximately reported. It is not expected they shall be closely ascertained. The regular schedule, so far, only contains inquiries as to the price of gas for lighting, and the price at which gas is sold for heating power purposes, with the quantities consumed in each direction, so far as can be ascertained, during the twelve months. But it strikes me that a request should go from this Association to the Superintendent of the Census, asking him that inquiry in this direction should be made as thorough as possible, and that the results obtained from such inquiries be made public as early as possible in a special report. I think he will very readily put on the possible little extra clerical force that will be necessary. I think that such a request will have considerable weight, and I would like to see it made. Of course you know that in the matter of these statistics, names of the companies are not made public.

Nothing is made public in the matter of particulars—the entire State of Ohio will appear as a unit, for instance, so that no one will know how much gas one company or another is selling, and no one will get at the minutiæ of your business. Of course, you are guaranteed against that by the Government. But in a matter of this kind, the different rates at which gas is sold throughout the country could be very properly gathered together without "giving away" the business of any particular company. It strikes me that such a request would materially advance the matter—the point toward which Mr. Faben seems to aim. I will do all in my power to have such a request granted, if made.

The President—It would seem as though here was a suggestion that it might be well for us to act upon before we adjourn. In this very matter my attention has been called to a case that presented itself after the introduction of a stove, or stoves, that were put in at the graduated rate, maintaining the regular rates for illuminating, and with the special view of increasing the sale of gas by "booming" the fuel trade. A prominent consumer came in very shortly, who was very quick to "catch on" to the situation, and desired that his gas be passed through a stove as well as through a meter: I think the point is obvious. (Laughter).

Mr. Strong—Mr. President, I think this manner of graduated rates is one that is peculiar to each individual city. It is one thing to manipulate a gas company where you can have the situation to your own liking and quite another thing when you have not. This matter of graduated rates came up before our company a year ago. We had been giving a little concession prior to that for gas used as fuel, but not enough to cut any figure in the bills, or in the increase of gas so used. A year ago, with a change of process, we concluded to "burn our bridges." So we reduced the gas used as an illuminant to $1.25, net, and for fuel to $1. We did that for two reasons: First, the comparative economy which we secured by getting a larger number of consumers, if gas was reduced to a price that was unmistakably cheap, rather than to confirm itself by one or two or three years' demonstration, which would only gradually come to the surface. Second: We find in our community, which perhaps has as large an amount of total depravity as you find elsewhere, that the man who burns a large amount of gas in his house at $1.25, or whatever the rate is, but in his place of business gets it for less money, he wants it as cheap all around. Now the larger consumer, who gets his gas at $1 per 1000, for instance, but who pays for it in his house at the rate of $1.25, is very apt to insist on the computation of the amount of gas burned, at the low price. Consequently, you are having continual annoyance, and, in case of competition, decided trouble. Now of course the arrangement that we adopted would require the setting of additional meters; but we increased our consumption the last year about 30 per cent. on the gas sold. In our community I don't think any other scheme would have been satisfactory. We have secured such a favorable opinion among our consumers that I think this year we will perhaps double our use of gas stoves. I think we have now very nearly 140 gas stoves—perhaps two-thirds of these are gas ranges—and the experience of those who are using gas was so complimentary to the company that a great many now adopt some means of warming their kitchens, using the surplus heat of the hot air furnace for such purpose, thus abandoning their coal stoves the year through. Our winter consumption for fuel is only 25 per cent. less than our summer consumption was last year, for same purpose.

A Member—The day consumption?

Mr. Strong—I mean the day consumption on gas stoves. In other words, we have a number who are throwing away their stoves and depending upon the gas fuel to warm their kitchens by means of hot air or steam. I think the great increase gas compaies can make in the amount of gas that is used, is in the direction of day gas, in cases where you have competition, as we have, by incandescent lighting.

Mr. Evans—It strikes me that if the price of gas is made low to large consumers (low per thousand feet) they would still have an inclination to save, whereas, if the price were based on their yearly consumption they would make it a point to reach those figures. For instance, a consumer who has been consuming 500,000 feet a year at $1.40 per thousand, say, would make that bill agregate $700 a year; but if the price were reduced (for 600,000 feet burned) to $1.30, the bill then would be simply $780, or he would get the last 100,000 feet for $80 or 80 cents a thousand. If the price was reduced still lower—for a consumption of 700,000 feet, say $1.20, he would receive the last 200,000 feet for $140, or 70 cents a thousand. You can carry that up to a million. For instance, if he used a million feet a year at $1 a thousand, he will simply be paying $1,000, and they will get the extra 500,000 feet for $300, or 60 cents a thousand. These are the figures I have gone into, contemplating making some reduction, as I said before, in the illuminating gas in mains that do not parallel our water gas. It strikes me that the tendency would be for the consumer to use the gas so as to bring the amount up to a point where he would get low rates. He could then illuminate his house or a hotel, whatever it might be, as much as he saw fit. I would simply make them their rebates semi-annually, or at the end of the year, billing their gas at the regular rates and making this discount semi-annually, or, as I said before, at the end of the year.

On motion a vote of thanks was passed to Mr. Faben.

Mr. Faben—I move that the Secretary be instructed to communicate with the Superintendent of the Census, asking that the data on the consumption of gas for uses other than lighting be extensively gone into. I have not the exact wording of the proposed letter. The Secretary can frame that. [Adopted.]

At this point Mr. H. Wilkiemeyer, of Portsmouth, read his paper, entitled:

MUNICIPAL CONTROL OF LIGHTING.

Man was born free. The Creator endowed him with the fullest liberty. He had not lived long until he got into trouble and discovered he needed protection against himself. He was wild and savage, and he knew it. He also knew that he was capable of better things than those into which he was led by his unbridled, unrestrained instincts. He therefore, for the sake of bettering his condition, surrendered certain of his inherent rights and entered into the social compact. He said to his neighbor, "You stop reaping the grain which I have sown, and I will no more feast upon the cattle which you have herded and guarded from the wolves." The ideas of "mine" and "thine" became more firmly fixed. There was compensation in this arrangement for all parties connected therewith. While one party, on his part, was compelled to forego the pleasure of stealing the goods of his neighbor, on the other hand his own chattels were the more secure. By the surrender of certain of his inherent rights, other rights were rendered more stable; greater security, both in purse and person, was realized, and out of these mutual surrenderings Society was formed. Therefore it may be laid down as an axiom that societies, or communities, exercising corporate functions, were formed and exist as a police measure. The *rationale* of the construction of the social fabric precludes the exercise by the municipality of all functions but those that are police in their nature and tendency. Whenever a departure from this rule occurs, then liberty suffers, and another item of natural personal liberty is sucked into the great vortex of centralization of power. It is therefore wrong, on first principles, for a city to engage in any other occupation or business than that for which cities, or communities, or society, was originally established.

The centralization of affairs in the Government is eminently unwise, for there is no limit to the venture. If the city has an inherent and politic right to go into the lighting business, it has also the right to go into the coal, clothing and grocery business. The result would be either absolute anarchy or abject slavery.

Societies should continue to serve the purpose for which they were created. It is dangerous precedent for them to go further or assume more. By absorption of all business, the Government would become paternal in its nature. Ambition would have no place in our make-up, and we would be a nation of nonentities, no man depending upon himself or his neighbor. We would be an army without soldiers, or perhaps we would attain that delight-

fully philosophic, but lamentably impractical, condition described by Bellamy in his recent novel, "Looking Backward."

But the question as to the advisability of a city's owning and operating a gas light or electric light plant, instead of being philosophic and speculative, is pre-eminently an economic and practical one; and the practical phases of it only should be regarded. Enthusiasts and men who have machinery and lighting apparatus to sell to cities (in the absence of a multiplicity of private customers), have at great expense been flooding the popular and scientific prints with long articles from the pens of hired sophists. By their fallacious but plausible arguments many a fair municipality, which was prosperous and peaceful, has been plunged into a state of disquiet, and has had a white elephant imposed upon it in the shape of a gas or electric light plant, which must forever be fed and nourished from the public crib, or which will, when the novelty of the affair wears off and when officers become negligent, be cast aside to be of no future use except as an undying memento of the folly of following the advice of persons interested in the sale to the city.

Of course the smooth-tongued agent presents the matter in a glowing light. It is his business. He has studied the points, and he knows what to push most forcibly and what to pass by as not worthy of mention. It may safely be laid down as an axiom, that whenever a city embarks in a venture that even savors of money-making, it is exceeding either its legal powers or is encroaching upon rights never ceded by the people.

Old adages are good, and as they have stood the test of time they must be true. "What is everybody's business is nobody's business" and "every man to his own trade" are two trite phrases that seem particularly appropriate in the discussion of this question. The managers of a city plant, however honest, have not, and can not have, the same material interest in its economical and successful administration as would an individual owning the same. Expensive experiments are more likely to be made when the cash does not come from the pocket of the experimenter. His salary is secure, no matter upon which side of the ledger the balance stands at the end of the year.

He has the credit of the city at his back, and a few thousands in extravagance will not be remarked by the public.

Looseness and carelessness are almost inevitable in the management of a city lighting plant. On the contrary, when the owners of the plant are its managers, every cent of the expenditures is carefully, jealously scrutinized. Men are employed because they will work, and they must work to their full capacity or seek employment elsewhere. They are not employed and retained in well-paid positions for political reward, but for the work they do. No man can secure an agent who gives the same attention to his affairs as he does himself, nor can a city secure the same service which an individual gives to his own affairs.

It has been argued that a private gas or other lighting company has a monopoly. Granted. But they are entirely different in their nature from mercantile monopolies. Take a private corporation, engaged in the sale of any given commodity. It can, if it has a monopoly in the article, establish a given price, and say to the public, "Either buy from us at our price or go without. We own it all, and you will have to pay what we ask." It is not thus with a lighting company.

Corporations have ever been jealously guarded by the people, and their power and privileges curtailed. Under existing laws, a monopoly in lighting is impossible. The city may fix the price which it will pay for gas for a definite time, and the company must sell at that price if that price be fair. There are so many other ways of lighting than by gas and electricity, that it is impossible for a company dealing in either to be in the least arbitrary.

True, a certain company may be the only one that has gas or electric light for sale in a given locality, but even in such a case it never has a monopoly in the strict sense of the word, or even in the plain business sense of the word. No man nor set of men can control the price of light. If A asks too much for his electricity, I can buy from B, the gas man: If A and B combine and run up the price, I and my neighbors can buy a barrel of coal oil, and while we are burning half of it A and B will come to the conclusion that they have made a grevious business error, and will quickly come to terms.

The people of a city have it in their power to dictate absolute terms to a lighting company. The company has money invested in its plant, and it depends on the people for its income. When the people withdraw their patronage, the income from the investment ceases, and the venture from that moment becomes unproductive. Now, it is plainly within the power of the people to exercise power over lighting companies in more ways than one. The Creator has placed in the bowels of the earth, and within easy reach, oils, by the use of which, for even a day, great loss ensues to a company. The plan and principle of a lighting company is to extend the patronage; this can only be done by keeping the price down.

The adage of an ordinary monopoly is, "Charge the highest price the purchaser can afford to give." The adage of a lighting company is, "Sell at as low a price as you can afford to take, extend your patronage, and run your institution to its limit."

Another restriction of which the public may avail itself, is this: Whenever the citizens discover that an unfair advantage is sought to be taken by the light company, they can, under the laws, call a halt. No private company owning a light plant can afford, by extortion, to drive the municipality, in which it is located, into a fight, which, in nine cases out of ten, means ruin. The value of the plant is virtually in the hands of the municipal authorities, and they can therefore exercise a summary and wholesome jurisdiction over the lighting company without investing a single dollar of the peeple's money. The claim, therefore, that a private lighting company is a monopoly, is erroneous. The municipality has arbitrary power, and would not, nor does not, hesitate to exercise the same when circumstances demand it.

It is said that a municipal lighting company can afford to sell at cost. But where the gain? Who supplies the money to pay the cost? Is it those who use gas and electric light? By no means. The men who live in a cottage and the cabin pay taxes. What does it avail them that a man who lives in a mansard can have his halls lighted by electricity at cost? They burn oil or tallow. Cost price is too high to enable them to indulge in electric light, yet they, the men who dwell in the humble houses of labor, the men whose brawn and muscle and brain made this country what it is, must be called upon to help pay for the illumination of the palaces of these princes and potentates of finance. It is unfair. There is no justice in it, and the system which compels them to do it is radically wrong. Let the man who wants an electric light buy it and pay for it if he is able; if not, let him burn gas. If that be too expensive for his pocket, then he should burn oil. If that be beyond his means, let him go to bed and get up aided by the tallow dip of our grand-mothers.

The system of taxing a poor man in order that a rich man may have his luxuries at a lesser cost, will never prevail in a land where justice has an abiding place. But, it may be urged, the owner of the small house must pay his proportion of the taxes, any way, and his taxes are lessened in proportion as the expenditures of the city are high or low; the city must be lighted, and if it is done at a lower cost by reason of the city owning the light plant, he benefits thereby. But the public, it has been estimated, forms only one-sixth of the patronage of a light company. And, therefore, he benefits himself to the extent of one-sixth, while he benefits his wealthy neighbors to the extent of five-sixths.

But is it an invariable fact that a city sells light at cost? Let us see if there are not reasons which lead, naturally, to their selling at a profit. The Superintendent and Directors desire to make as good a public showing as possible. They do not care to have it appear in their stated reports that the business which they have been conducting cost more than it brought in, so they, in order to demonstrate managerial ability, are naturally inclined to put up prices. This is not only true in theory, but in fact. In the city of Portsmouth, Ohio, for example, seven lamps are sold to the county and to the railroads. Each lamp, according to the statement of those in authority, costs less than $30 per annum. Yet the county and railroads pay per year for each lamp the sum of $100. Surely, no private corporation would be suffered to do thus, nor would it have the temerity to try, "soulless" though it be.

Capital is crystallized labor. Every dollar is made sacred by hours of labor. Every penny represents a drop of sweat that falls from the laborer's brow. Capital, as well as every expenditure of mind or matter, must bring its compensation. The legitimate purpose of capital is *investment*. The man or the policy which prevents the investment of private wealth in a town or city does a wrong to labor. Yet this is what a city does when it embarks in the business of selling light.

It is urged by some writers, as an argument in favor of municipal ownership of light plants, that the cost of light in cities owning their own plants is so much less, by comparison, than those lighted by private companies. But these writers invariably fail to tell us the tax rate in these cities. Why this omission? Can it be that the force of their argument would be lessened by the publishing of that very important factor? Is it because this important fact would give the lie to the assertion that a saving is made by the city's operating the light plant?

The capital of a city is derived primarily from the pockets of the people; secondarily, from the vaults of the city treasurer. It is not an exercise of solid political economy to allow the people's money to be invested in a commercial undertaking.

No industry is generated unless there is, as an object, a profit. The motive for private capital to invest in a certain line of business is destroyed, annihilated, when a city enters into the same line of business and conducts the business with no desire to make a profit. It is a dangerous principle, and one subversive of all our cherished ideas, that a city may forestall the investment of private capital and assume and arrogate to itself a certain line of business without profit as an object.

No man should be willing to be taxed in order that a city should secure capital with which to strangle private enterprise. If it is good policy to allow a city to embark in and run and manage a light plant, it is also good policy to allow it to own and manage street car lines, telephone service or a meat shop. It receives its capital from taxation. It has no interest to pay except upon the pledged credit of the municipality, nor is it taxed. It can exist forever without making a cent of profit. And when the credit of the city is pledged the citizen is taxed once for the principal and once for the interest. The city, which needs no profit, competes against private enterprise, and so successfully as to deprive it of all hope of a reward. It is driving private capital from one investment to another, because private capital must increase or decrease, while the city is doing all that is requisite when it comes out even.

It does not have to eat or wear clothes. It has no doctor bills or funeral expenses to pay, no school books or taxes or interest to pay, and it can live without making money. It is to the interest of the citizens that cities do not own and operate a light plant.

The President—Gentlemen, we have just listened to, I was going to say, as good a paper as I ever heard read; but I ought not to manufacture capital here for any man's paper. I will say you have listened to a good paper and it ought to be thoroughly discussed. I surely hope it will be.

The Secretary—Mr. President, I would not want to say anything that would block the discussion of Mr. Welkiemeyer's paper at once; but I will mention, as proof of the interest now being taken in this question, we have voluntarily offered to us at this meeting two further papers on this same subject. Before leaving Columbus, yesterday, I was surprised to have handed me a nicely type-written paper entitled "Municipal Control of Gas Works," by a gentleman connected with the Columbus Company. I had invited him to attend and help discuss this question, as I knew it was one in which he would naturally take an interest. He has given economic and social questions a good deal of thought. It is his bent, and his opinions are worthy of consideration. He was unable to attend, but had prepared a paper embodying his views. I read the paper on my way here. I thought it merited presentation in the same form in which the other papers have been presented, and on arriving here I immediately had enough copies printed to distribute one to each member. Furthermore I have a letter from Mr. Foote, of Washington, D. C., which reads:

"*Dear Sir:*—I expect to leave here Wednesday morning and to arrive in Toledo Thursday morning. Had expected to get off today, but find I cannot do it. I enclose you a copy of a paper I have prepared to be read before the Association. If by any mishap I should fail to be present, will you kindly ask Mr. Graeff, or someone else, to read it for me? Yours respectfully,

ALLEN R. FOOTE."

The President—Gentlemen, I know nothing more of these papers than you know. You have heard the entire statement. It would appear to me that our interests might possibly be subserved by having the reading of these other papers and discuss this question afterwards. Mr. Wilkiemeyer is with us, and perhaps Mr. Foote may be. He will not be, however, in time for this discussion; yet a motion that should cover this ground would be a quite proper thing to entertain at this time, and I trust if anyone cares to hear from these other papers that he will make a motion that will recognize them.

Mr. Cantine—I move, Mr. President, that the discussion of this paper shall be postponed until those of the Columbus gentleman and Mr. Foote shall be read and then discuss the three, as they all bear upon the same subject. [Adopted.]

Mr. Cantine—Mr. President, during the distribution of these papers I would like to present to you the name of Mr. O. S. Webster as a member of this Association. He is a resident of Michigan, and he has been tried by fire as hot as that required to make gas. He and I suffered and bled for our country in the same regiment. He came down here and offered himself as a sacrifice, and I now introduce to you Mr. Webster.

The President—I have no doubt the Association will be glad to greet Mr. Webster. The blanks upon which his application should be made will be provided by the Secretary, and at the same time there are a number of others whom we desire to welcome to our ranks. I suppose we may defer that a little longer. I will now ask the Secretary to read Mr. Gemunder's paper.

The Secretary then read the following paper, by Mr. M. A. Gemunder, of Columbus, Ohio, which had 1or its title:

MUNICIPAL CONTROL OF GAS WORKS.

Leaving out of question the points raised by socialists who claim that the true function of government is to take charge of all lines of production, and looking rather at those put forward by individuals who acknowledge or allege that state agency is not equally effective in every department of industry, will at this time be more to the point, as the latter opinion is that which is held by the most numerous antagonists of private interests in the line of gas supply. Many of the most advanced thinkers have long ago given up the idea that the public can best be served by competing companies, and hence term the agencies which furnish such commodities as gas, water or electricity, natural monopolies.

It is further stated that as our commonwealth and national institutions are opposed to privileged classes, that is, guaranteeing some citizens benefits at the expense of others, and as it would be necessary to foster such, if competition were abolished, in order that the best service may ultimately be secured, it follows that expediency, as well as sound statesmanship, would demand that the people as a whole unite in controlling that which should minister equally to the welfare of all.

This seems plausible enough, but unfortunately the community as a whole, that is "all of us," never can operate either a gas, water or electric plant. The public can only work through special agents—that is, through "some of us"—and it is through the short coming of "some of us" that the expectations of "all of us" so frequently lack realization.

The main argument advanced by many advocates of municipal control, such as Professor Ely, of Johns Hopkins University, or Mr. Keeler, in a recent article in the *Forum*, is an arrangement side by side of prices charged in various cities by public or private works for like services, and which are so selected and grouped as to show off private concerns to the poorest advantage. Now, anyone connected with a gas company must know that such comparisons made in this manner are absolutely worthless. It can be readily seen that even greater differences in rates exist among the various individual plants worked exclusively by private capital, and as to public corporations, their own charges are not at all equal. There is no fixed or uniform difference in favor of any particular order of management which would appear thus at a glance. We all know that variation in price is very seldom due to any one particular factor. Admitted that Philadelphia (public) charges less than San Francisco (private), does that prove anything? If this difference would lead to the drawing of an inference, would it not be offset by the fact that Cinncinnati and Columbus, both with private institutions, charge considerably less than Philadelphia?

The figure at which the public is supplied is the product of many factors, not only such as the cost of coal and the several crude materials used in distillation, but transportation, location of works, size of cities, number of consumers, width of streets, style of architecture of buildings, habits and general prosperity of people, and a host of minor conditions, many or all of which are peculiar to certain localities and very few common to all. It is not here contended, however, that no system of statistics may give rise to accurate conclusions, but only, that they must be very carefully sifted and examined and then accepted with due caution. Prima facie, as before stated, they are exceedingly treacherous. Discarding as insufficient the statistical method for want of proper data, and reasoning after the manner commonly called "on general principles," let us see if it leads to trustworthy results. Muncipalities either do or they do not furnish increased blessings; if they do, then there must be a reason therefor; if they do not, failure must be due to some ascertainable cause. This is the problem:

A comparatively few years ago there was first demonstrated a law, that of the Conservation of Energy, which is of the utmost importance in physical science; it has done more to place that science on a firm basis than probably any other single discovery. This law, as you are probably all aware, asserts that: "The quantity of force which can be brought into action in the whole of nature is unchangeable and can be neither increased nor diminished."* With the full recognition and comprehension of this law, there was a sudden disappearance of all search after perpetual motion and such like phantoms, for it became evident that whatever extra energy appeared to come out of one end of a machine, it was only a question of how long or how well one looked before it would be discovered that it entered at some other end.

The critical spirit thus generated in the domain of physical science is at present also strongly permeating and affecting the manner of thought and examination in Social and Economic Science, also finding outlet in everyday life in the saying that "something out of nothing is not to be had."

All arguments for public ownership when analyzed yield simply the following: Muncipalities would offer greater service for the same pay, or the same service for less pay than private organizations. That is, its labor is in some way more productive. More energy leaves the machine—where does that additional energy enter?—whence does it come?—We are certain that it must spring from some source, for Government can no more make something out of nothing than can the least important individual.

Suppose that the Government purchase a coal mine for the purpose of supplying itself with fuel. It will of course be acknowledged that after the purchase the coal will be just as deeply imbedded in the earth as before, the mere fact of the public having become the owner will not of itself raise it even in the slightest degree. Where then must the extra energy be looked for? Undoubtedly in the only remaining source, namely, the brains and muscles of those depleting the mine.

But, after all, as previously seen, these factors are furnished not by some unusually potent entity, but only by "some of us," very much like the "rest of us." Naturally, if these "some of us" are no better than the "rest of us," Government brings no new or unusual forces to bear, and it would be folly to state that its efforts entail superior results. This would surely be getting something out of nothing.

It may be replied, however, that there is a difference among the various individuals comprising "all of us," and if the best are chosen to perform a certain duty, their endeavors must yield the most satisfactory consequences.

This then brings us to a direct comparison between Government officials and private management. Here arise two questions:—

First.—Are the "some of us" chosen to perform certain functions really for the "best of us," for the purpose?

Second.—Are conditions such as to demand from them their utmost?

As to the first question, little attention need be paid. The reputation for ability and morals of the general run of Legislators, office holders and politicians is so well known as to require little comment. It is only in rare instances that they are selected, or, when selected, retained, because of any special fitness displayed. The Civil Service Reform movement of to-day will go far in bearing out this statement.

Mr. Donisthorpe, in a recent economic work, makes the following

*Helmholz.

pointed comment: "The art of Legislation is a very difficult and complicated study; much more so than farming or boot making for example, and yet, as has been remarked with amazement by thinkers of the weight of Socrates, Shakespeare and Spencer, whereas a lifetime is required for the mastery of the humblest handicrafts, almost any ignorant busybody is credited with intuitively understanding that most intricate art, legislation.

"Were I to walk into an engine room and point out to the engineer the intolerable waste of steam entailed by a hole in the boiler, and urge him to stop it, he might turn upon me with some such reply as this: 'Sir, that hole is called the safety-valve; if you would bring your mighty brain power to bear on some subject with which previous study has qualified you to deal without making an ass of yourself, you might be doing more good to the community and less harm to me. Good morning.' And yet this same engineer will walk into the great legislative laboratory where the complex parts of the machinery of state are forged, and with the serenest self-confidence take off his coat and set to work."

That this state of affairs is owing to the nature of things and is likely to remain thus for an indefinite time, is more than probable. The brightest and strongest characters and intellects will of necessity be monopolized in those productive channels which promise the greatest reward to industry, these of course existing largely outside the sphere of government.

An excellent illustration of this tendency was furnished some time ago, when President Cleveland was somewhat taken to task for what was considered unreasonable delay in filling some vacancies that had occurred in a very important commission; the President replied and justified himself by saying that although he knew of many men capable of filling these places, yet the salaries and incomes that their labors in other fields yielded them were so great that the remuneration offered by the Government, generous as it may seem, presented no temptation.

The first question may be dismissed without further discussion, as all are familiar with its bearings. The second is, however, of greater importance.

The testimony of all human experience is that man endeavors to satisfy his wants at the least possible expenditure of his energy, and consequently the greatest exertion is only concomitant with the greatest need of pressure.

Should A desire the performance of a piece of work and be unable to attend to it in person, he would be compelled to delegate B to carry out his plans. Under what restraints would B now consider himself for the performance of his duty? Evidently he would consider himself responsible only for ordinary reasonable care, and if he be honest, his sense of responsibility, together with the fixed amount of his reward, would prevent his taking any but ordinary chances, for fear of exceeding his authority, thus fixing upon himself a certain loss with no direct prospect of possible gain. His action must be conservative and not progressive, hence not in the highest degree productive.

Should, now, B sublet to C, then it must be plain that A's chances of receiving good service will also diminish. The only desire in B and C is not so much the fulfillment of A's plans, as it is to put in honest time, with the risk limitations already specified, at his expense. A, on the contrary, not only risks the loss of his expected benefits, but also the pay of B. The greatest anxiety for success is surely with A, and were conditions favorable so as to allow A to labor in his own behalf, it would not be hard to designate the source of the greatest energy.

The old maxim "if you wish a thing well done, you must do it yourself," has hardly arisen without a foundation in experience. Probably every one has had more or less occasion to appreciate its truth. Its application here is simply this:—

In all private corporations and business concerns, those who control and manage them are either those who directly own them or else stand in close relation to them. They are those who directly pay the penalty of a mistake, be it honest or otherwise, not only by being discredited in the eyes of one's neighbors, but capital earnings and very existence are at stake. It is here that employees are most carefully tested, and possible gains or losses most rigidly compared and weighed. Rewards and penalties being less remotely connected with conduct, cause and effect better apprehended, the greatest scope is given to productive energy and skill.

But how do matters stand in public hands? Here all action is of the delegated kind, and agents are held responsible for their trusts only in a more indirect way, and disaster for misconduct is far lighter and less certain in its effect.

Inducement to extraordinary action is lessened and it may be accepted as a certainty that the more we shift or separate those consequences which naturally follow any line of conduct from such conduct, the poorer will be the outcome.

All will probably remember the State's action in the Scott Law contest. Here legislators passed a law, taxing a certain class of business houses. This tax was in many instances promptly collected. The Supreme Court later declared this law unconstitutional and the collection of the tax unwarranted. Those who had paid the tax to the State expected naturally to be reimbursed, but here the courts again held that this could not be done without committing another wrong. Great loss to honest tax-payers was the result.

But how fared it with those whose ignorance directly caused this distress! Does any one even remember their names? Was the suffering in any way visited on them? Did they not draw their full pay and come up again for re-election the same as ever?

It may be said that they, as fellow-citizens, share public calamities; which would be true in the same way that a man loses by laying down a dime and taking up a dollar.

Would it not be more than probable that if the legislators who passed the act could have been given to understand that they would be held directly accountable for any wrong committed, their actions would have been much more painstaking and deliberate?

The *vicarious nature of all Government action* must always continue to be the cause of inferiority in all State and municipal management. It is and will ever remain the element of weakness that will prevent the raising of any superstructure with State or municipal management as a foundation. This doctrine I hold as of the utmost importance, and were it more generally appreciated, it would often save the community great loss.

Returning now to the mining example, if the coal fails, by reason of state ownership, to be raised nearer the surface, and as we see that the brains and muscles applied for that purpose are of a restricted and inferior kind, then it cannot be maintained that Government management can be the most productive. No extra energy can leave such a machine, for none has entered.

There is yet another argument that deserves consideration. It may be claimed by some, while acknowledging the greater economy in private supervision, that the chief object in municipal control is the prevention of excessive rates, which are the result of undue profits in monopolies; that the community could better stand a waste in production than a greater loss by extortionate charges.

Here again is an oversight. Every municipality, when franchises are granted, has the power to make such stipulations as regards rates, etc., as may be mutually agreeable. If it fails to possess the requisite wisdom and purpose to make this single agreement a good one, on what possible grounds can it be expected to make good the innumerable ones connected with the carrying on of even an ordinary enterprise with any better hope of success?

No city need be at the mercy of any corporation. It can easily secure for its franchise such a rate as will allow only fair returns on investments. Permit this rate to extend over a definite period of time, allowing the corporation the entire benefits resulting from any improvements introduced, this will prevent stagnation in efforts. At the expiration of the allotted time renew the contract at a new rate, which has as a basis the now improved manner of production.

Private control has another great advantage, namely, it throws the entire cost of production on those who are the consumers and beneficiaries, and does not require any deficit to be made good by those who had no such advantages, which is the case where loss is repaired by general taxation.

Neither is the present generation of tax-payers saddled by any heavy debt, incurred in erecting works, in order that future generations may reap the benefit for nothing. That is to say, every one will pay his own gas bill.

The President—Gentlemen, the paper of Mr. Foote is not printed. A copy is in the hands of Mr. Graeff, and we will be pleased to have him now read it.

Mr. Graeff then read the paper of Mr. Foote.

MUNICIPAL CONTROL OF GAS AND ELECTRIC LIGHTING PLANTS.

That system of political economy is best which enables the poorest member of society to become richer. The breadwinner must have bread now. For this reason, economic systems, promising immediate benefit, quickly become popular with the masses. In political contests present advantages always strive for the mastery, with duty to principle. While an election is pending the wage-worker has many friends. Why? Because, by reason of numbers, his class holds the balance of power. There is always much talk about measures to make this or that thing cheaper, or, in general terms, to make living cheaper. The advocates of cheapness do not explain, and the wage-earner does not think far enough to see, that cheaper living means lower wages. With living and wages both made cheaper the economic condition of the wage-earner remains unchanged.

Civilization has entered upon an era of economic evolution. I say evolution, because progress in the development of an economic system, in accord with the requirements of natural economic law, cannot be induced, except by a condition of general and high degree of intelligence, an intelligence that will not permit the destructions of a revolution. Creeds of churches and codes of secular law have reached the limit of their power to benefit the people without taking into consideration the economic conditions under which they live. He teaches both religion and patriotism who teaches the principles of natural economic laws. The power given by nature to man to produce more than he consumes gives him the power to relieve himself from the law of necessity. It is his natural birthright to freedom. Benjamin Franklin's formula for making money plenty in the pockets of every man is based on natural economic law: "Earn money honestly, spend less than you earn, and save the difference." 'Tis simple, but not easy to do. The first requires strength; the second, courage; the third, intelligence. It is because of the lack of economic intelligence that there is any failure in justice in the distribution of the results of labor. For this reason, questions tending to create popular interest in economic science should be welcomed, not feared.

The new departure in the discussion of labor questions under-

taken by the Emperor of Germany; the recommendation of government ownership for all interstate railroads, by President Blackstone, of the Alton system; the effort to initiate government ownership of telegraphs, by Postmaster-General Wanamaker; the use of crop values as the basis for a national currency, advocated by President Livingstone, of the Farmers' Alliance; the monster petition to bear the signatures of 200,000 persons, asking the Massachusetts legislature to give cities and towns the right to establish their own gas and electric light works, to be presented by the nationalists; the use of land securities as the basis of a national currency, proposed by Senator Stanford of California, together with similar projects by others, make up the moraine of of the oncoming economic evolution.

The advocates of municipal control of lighting give but one reason for their policy. It is that it will make the lighting service cheaper. The same argument will serve equally well, a movement for municipal ownership of gas plants; electrical plants; street car lines; ferries and telephone exchanges. More than this, it will suit just as well, a demand for the national ownership of railroads; telegraphs and the express business.

But why stop here? It will apply with still greater force to the national ownership of every productive or distributive industry. If a municipality can perform any service cheaper than it can be done by a private individual, a state can do it cheaper than the municipality, and the nation can do it cheaper than the state. If a single industry can be so handled, then every industry can. The logical sequence of municipal ownership is national ownership. The inevitable result of the control of one industry by government monopoly, will be a government monopoly of all industries. Those who do not wish to see the principal of municipal ownership carried to its logical conclusion, should not advocate it. Those who do not desire the national ownership of al lindustries, should present a united opposition to municipal ownership of any industry. No dam will ever burst if the first leak appearing, be effectually stopped. No great fire will ever occur, if the first blaze be instantly quenched. No great disaster will ever cause wide-spread destruction or suffering, if its initial cause be judiciously and promptly removed or overcome.

All theories must stand uncovered in the presence of facts. Economic theories are not relegated to the far off future for a demonstration of their correctness. The results of municipal ownership may be proven now. There are a sufficient number of undertakings of that character now in operation to render the demonstration complete. If the claims of those who advocate municipal ownership be true, they can prove them by accounts now being kept. I challenge any municipality in the United States owning a gas or an electric light plant, to submit the question of the policy of municipal ownership to the abitration of provable facts. That this may be done, attention must first be given to the classification of items and the form of accounts of receipts and disbursements. The greatest difficulty in the way of a proper solution of this question, is the fact that there is no scientific classification of the items of accounts, made with a view of causing them to show all essential economic details, nor is there a close scrutiny to prove their accuracy. The people do not know whether the accounts are properly kept or not. They do not know whether or not, every item that enters into the cost of the plant, its operation and maintenance, is properly charged. Laxity in scrutinizing the methods in which the proceeds of the tax are expended, is a strong objection to indirect taxation. Wherever there is a lapse of vigilance, there is a lapse of virtue. Consider the lamentable failure of the vast majority of men to conform to the requirements of an exact science of economy and accounts, in the management of their private receipts and expenditures, then consider that such imperfectly developed economists are entrusted with the management of the accounts of municipal works, and a fair idea of the difficulties to be met with in this direction, may be formed.

Not one man in one hundred is able to give an exact account of every dollar of his private income and expenses at the end of a year. This is the reason why it is so difficult to carry into practical effect Benjamin Franklin's formula for making money plenty in every man's pocket. The accounts of partnerships are probably more carefully kept than any others. This is because those interested in them are few. They are vitally interested in the results of the business, and as a necessary consequence, give their accounts a most careful scrutiny. The accounts of stock companies are scrutinized much more closely than those of municipalities. The managers of such companies know that they have among their stockholders able critics, whose invested interests will lead them to give their accounts a most rigid examination. The history of the management of stock companies demonstrates the fact that, wherever there is a lapse of vigilance, there is a lapse of virtue. The human nature of managers of municipal works, is not different from, nor better than the human nature of men in the management of their private affairs. If men are not exact and honest with themselves in the management of their own finances how can they be made exact and honest in the management of municipal finances? The only safe-guard for the man and for the municipality, is the regular publication of accounts in approved forms, showing every dollar of income and expense, in items classified in accord with the requirements of a sound economy. The question of honesty is of minor importance in the demand for a scientific system of economic accounting. A system of accounting that will satisfy economic requirements, will satisfy all moral requirements. Morality has no existence apart from the principles of natural economic law. Money may be spent honestly and not be spent economically. There can be no scientific demonstration of economic results, without a scientific record of economic operations. Upon such data only can economic policies be safely based. Those favoring municipal ownership can afford to wait until such data can be obtained, before committing their municipality to a measure of doubtful expediency, and one that may ultimately prove undesirable.

This demand for scientific investigation of, and basis for, economic action, is in the interest of the poorest member of society. It is in the interest of the whole people without distinction as to their economic condition. It is in the interest of the municipality, of the state, and of the nation. Every economist, every candidate for votes, that favors municipal control of lighting, and who is honest in the opinions he holds, cannot refuse to join those who oppose that policy, in demanding that all accounts be kept in accord with the requirements of a scientific classification of receipts and disbursements, to show all essential economic details. This demand is in the interest of good government and good morals.

I say to the people of all municipalities that have committed themselves to the principle of municipal ownership, you have entered upon an economic policy that will ultimate in industrial slavery. You sought escape from a limited monopoly, and have established an absolute monopoly. You are levying a tax on consumption, instead of possessions. This is the most inequitable form of taxation. Professor Richard T. Ely says, in "Problems of To-day," pages 6, 7, 10 and 11:

"Indirect taxes are chiefly taxes on commodities; in other words, taxes on what we eat and wear and consume in other ways. This is taxation on consumption; but does consumption of taxed commodities vary with income? Indirect taxation does not discriminate between the last dollar of the poor widow, and the dollar which is only one in an income of a million. Indirect taxes are imposed on people without creating so much discontent as direct taxes, and without causing so close a scrutiny of the method in which the proceeds of taxation are expended, because the mass of men do not realize that they pay taxes every time they purchase gas and electricity for lighting, when the municipality owns the plant."

Prof. Ely did not write "Gas or Electricity for Lighting," as given in this quotation. He wrote "Dry Goods or Groceries." I made the substitution, which does not change the principle or meaning of what he was saying, so as to make it more directly applicable to the policy of municipal ownership which, strange to say, he advocates. When the municipality owns the plant, the wage earner and the millionaire pay exactly the same rate for the gas they consume. The profit on that gas compels the wage earner to pay a tax a thousand times greater in proportion to his income, than the tax that is paid by the millionaire.

The policy of municipal ownership of lighting-plants can be successfully combated upon practical lines. Let the whole truth be known regarding the accounts of such plants, let the people become thoroughly educated as to the workings and tendency of such undertakings, and, speaking of one of them as representing the whole, the sale of the Philadelphia gas plant to private ownership and management, will become a political necessity.

Discussion.

The President—Gentlemen, that concludes the three papers upon this subject. I think it rarely falls to the lot of an Association to have more valuable subject matter presented than is contained in these three papers. I see only one possible misfortune in it, and that is that they are nearly in the same line. I trust a discussion will develop here that will bring out the full merits of what has been presented. The papers are at your disposal.

Mr. Cantine—Mr. President, I see only one trouble about the matter, and that is there is no one present who would take the affirmative. A great many people in this country have not anything an I would not like to have any person else have anything. They would like to divide up. They would like to be in the year 2000, and "look backward;" but, nevertheless, they would not keep their credit cards 30 days! Eleven months in the year they would starve. Now if any person thinks that municipal ownership of a gas plant is a good thing it would of course also be a good thing for the municipality to own everything else, and we would very soon come to the condition that Egypt is in, where the Khedive owns everything. He builds the railroads, runs the hotels and steamships, and everything else. Nobody owns anything. He has as many wives as he wants, whereas the poor man is satisfied with one poor little wench. Whenever the Khedive wants anything built, he builds it as Solomon built his temple. He pays no wages; there is not even a chance to get a little of the common stock of the concern, which is generally worth nothing! The individual detailed to work upon a railroad, canal, or hotel, or what not, has no prospect whatever. His poor wife brings him his scanty sustenance. She tills the ground and raises his living. If the people of the United States want to get into that condition they should start in and have the Government run everything, and thus remove all the opportunities of making a livelihood and reduce to a vassalage nine-tenths of the human family.

Mr. Wilkiemeyer—Mr. Cantine says this is a one-sided affair. Granted; yet it is an *affair* talked of, and also introduced in a number of places, and the agitation of this question will most likely give us many sleepless nights. Now then, let us seek the first cause of this affair. I will challenge you all to cite me a single case in the State of Ohio where the city controls a gas works or an

electric light plant in opposition to an already established plant, where the gas company was not prime mover by its unfair treatment, injudicious action, etc., all leading to those baneful and most distasteful words—"you *must*" being hurled at the people, and the people resenting in this manner.

The President—I hope the entire party won't take up the gauntlet at once!—(Laughter.)

The Secretary—Mr. Graeff must be familiar with this question; and I should think for the information of some of us, myself included, I would like to ask Mr. Graeff to give us, in brief, the arguments of those who favor municipal control; and, furthermore, if there has been some activity in this direction over the country—"if there's a cloud as big as a man's hand in the horizon, that may grow into something formidable"—I would like to know definitely what danger threatens us in this direction.

Mr. Graeff—Mr. President, I think I am very poorly equipped to answer that question. I think Mr. Wilkiemeyer has given a fair outline of the argument in this paper of his; but, as I see it, the argument is a very short one. It is simply the one against monopoly. A municipality can furnish gas cheaper than a private corporation can, for the reasons that Mr. Wilkiemeyer gives in his paper. Of course the municipality all the time has nobody to consult except the politicians who run it. I believe that is about the argument of the other side. But as regards this cloud the size of a man's hand, I am one of those who recollect that there was a time when that story first begins, when the cloud was not seen at all. Then, at the next observation, the cloud began to appear, and finally there came such a storm as startled those in that part of the country. I think this question of municipal control is growing at a rate at which I think Mr. Wilkiemeyer—and I think he has looked into it as much as any of us—does not appreciate. As he states, it is being agitated and pressed by those who have anything to sell to a municipality. I would like to see a full and fair discussion of this subject. I don't believe there is any question to-day that can be presented that is more important, not even the question of fuel gas; and with this question goes that other of legislative action in regard to gas companies. On that I trust we will hear something to-morrow. I would certainly like to see the discussion of this very full and free. I don't exactly agree with Mr. Wilkiemeyer on one point. He says the poor man pays for the gas burned by the rich man; that the man who lives in a cottage and burns oil when the municipality owns the plant, pays for the gas that the man who lives in the mansion burns. Well, now, my experience in Philadelphia is that the man who burns gas and pays his gas bills, pays for the street lighting of the man who burns oil. Philadelphia sells gas at $1.50 and the city uses all the gas it chooses to consume for street lighting and other purposes. Therefore, instead of the man who burns oil paying for the lighting of the man who burns gas, in this case the man who burns gas is paying for the street lighting of the man who burns oil, which I think is fully as unsound as the ground on the other side which Mr. Wilkiemeyer takes.

Mr. Wilkiemeyer—Is not that an exceptional case?

Mr. Graeff—I hope it is.

Mr. Wilkiemeyer—If a private company had the plant in Philadelphia, what would it furnish gas at—$1.50?

Mr. Graeff—I am not quite big enough a gas man to place myself on record, but I think no gas man who understands the condition of things in Philadelphia would say that we would not have gas at $1.00 per thousand, if a private corporation owned that plant; but the city might then have to pay for its gas.

A Member—I don't think you understand Mr. Wilkiemeyer on that point. Where does Philadelphia get the capital to invest in that plant?

Mr. Graeff—The capital, of course, was raised, in the first place, by loans, which loans have been paid off from the profits on the plant.

A Member—How do they pay them off, with taxes gathered from the poor as well as the rich?

Mr. Graeff—They pay them from the profits resulting from the sale of gas. The works earn the money and pay off their own loans.

Mr. Cantine—Mr. President, not wishing to occupy much of the time, I happen to think of a case that is germane to this subject. I know a town about 20 miles from where I live that owns its own water works. In the town in which I live a New York corporation owns the water works. We pay, I think, $6.00 a year for domestic purposes. In the other town I think they pay $3.00. The people are very much better pleased, I think, in the town where the town owns the works. That is the non-taxpayers are. Those who use the water are much better pleased with the $3.00 rate than those who pay $6.00, but there is a *deficiency*, and the tax-payers are very much displeased for this $3.00 rate. Now, there seems to be just about where the trouble all comes in. The tax-payer is very well satisfied with the gas works at their present prices. This I think has effected, probably, as much as anything else, the putting of the price down to where it is. Gas is sold in this country as cheap as it ought to be, considering the facilities for making it, etc. It is an open question whether the general public are better served under a municipal control than privately. I think not. In the former case all the ward heelers are employed as hangers-on, without caring to do any good for the corporation. It requires an immense amount of inspection in all these municipal plants at certain seasons of the year. It takes a great many men to inspect a few street lamps. Ten or 15 would be a good day's work for a man to go over, and see whether the lamps are properly cleaned. After election is over, they don't get any more inspection for a while. Philadelphia used to require from $800,000 to $1,000,000 a year appropriated by the Council to meet deficiencies. Now I don't know at what particular time they commenced to pay this debt that Mr. Graeff speaks of, but that state of affairs was, I think, true eight or ten years ago.

Mr. Graeff—Mr. President, I think all the appropriations made by the city of Philadelphia for its gas works were made in the shape of loans, and I think the last of these loans has recently matured and been paid off, or there may be one still remaining. But as I understand it, all the money advanced was in the shape of loans to the Trustees of the work. I think that is correct.

Mr. Tayler—Mr. Chairman, Mr. Wilkiemeyer says he challenges any one to show any gas company in the State of Ohio that has not brought on its own troubles. I don't believe he is right. I am not speaking with reference to any particular plants, but on general principles. I think the facts are that the older companies, at least a great majority of them, did not provide against this in the way they ought to have done in earlier days; and, speaking generally, I think gas companies are to blame for the trouble they are *now* experiencing, but I don't think Mr. Wilkiemeyer's criticism applies to a new company that has started in, say, of later years, and has found the citizens already opposed to gas companies (simply because citizens are opposed to them all over the country) and found city councils ready to take all the advantages they can of them, simply because it has been done so before in other places, and in fact because it has become the general complaint all over the country. But I have no doubt that a great many gas companies are experiencing trouble of that kind who in fact are not to blame at all, and who have treated the community fairly.

Mr. Cantine—Mr. President, we don't need to own up that we have done anything wrong. I deny the soft impeachment that we have done wrong. We have not done anything of the sort. Simply because we, as corporations, have paid our debts, treated our men well, paid our taxes, never on the delinquent list, never any executions, never any companies went into liquidation, never made any assignments or re-organized under an order of any court and scaled our debts down and paid our debts off in stock that is worthless, but because we have simply walked up like gentlemen and paid our bills, and done what was right, we have incurred the enmity and hostility of that mean, contemptible spirit that this country is full of. That is all that is wrong. (Applause.)

Mr. Wilkiemeyer—Why do you pay your taxes?

Mr. Cantine—Because I am compelled to.

Mr. Wilkiemeyer—Why are the gas companies reducing their gas rates?

Mr. Cantine—Competition.

Mr. Wilkiemeyer—Competition! Because they have to?

Mr. Cantine—Yes, sir.

Mr. Wilkiemeyer—Now, then, suppose the gas companies, before the electric light people compelled them to come right down to business and go to work, and not sit in the office for customers to come around, but go around and bring them up, had done that before the electric light came in, how much of an advantage would the gas companies have over the electric light companies to-day?

Mr. Cantine—Not a bit. I sold gas, when I had an opportunity to, at 50 per cent. profit. I was not good enough to sell gas at cost and lower. I made hay while the sun shone. I made money out of it, and I don't deny it. I would do it over again. If I started in the gas business to-day, and could get $3 or $5 I would take it, and I wouldn't go around soliciting either, not a bit, unless I had to. Competition compels people to do lots of things they don't like to. I am here to tell you the truth. The chief reason that we sell gas for $1.25 in our town to-day is simply because we have to; and we are on the upper side. We are not the under dog at all. We once sold gas for $5, and we got that rate then just as easily as we get $1.25 to-day. The thing amounts to just this, that we don't know so much about other business oftentimes as we do our own—that is a common thing, and we ought not—but I have been engaged in other lines of business, and I know, taking all the commercial businesses of the country, that there has been a gradual—well, I may almost say there had been a rapid scaling down of profits. Take the money that you have in your Portsmouth works, let somebody pay you cash for them, and you will lay awake at nights to consider what to do with your money. You can't put it in banking because you have to do a credit business. You don't dare to put it in merchandise, because they sell too many things at less than cost to realize a profit. Once we didn't have to do that. We sold women's blue calico dresses at 50 per cent. profit. You can buy the same at 20 or 25 per cent. less now, but the price wasn't lowered until it had to be. That is all wrong, you say. There is not very much in the way of business now that is right, and as we are a sort of bright and shining mark the public are shooting their little arrows and shafts and darts at us continually; but they don't puncture many of us, nevertheless. The only fear I have of the gas interests of this State is that they will swamp us with taxes. I think from the account of the meeting of the State assessors in Columbus, that they intend all of the property shall be appraised at its full value. You will find there will never be any diminution of the rate per cent. You had a very able paper on that once, Mr. Wilkiemeyer. Nearly all the cities and towns are taxed 2½ per cent.—26, 27, and even 30 mills on the dollar. You will get a worse black eye there than you have on the price of your gas. I move you, Mr. President, that the thanks of this Association be tendered to the authors of the three papers last read. [Adopted.]

Prices Charged for Gas in 62 Cities of Ohio a

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City.	Name of Company.	Price to private consumers for illuminating gas per 1,000 cubic feet.	Price to private consumers for Gas used by Stoves and Engines.	No. of public St lamps.	Price per year per post public St. lamps.	Size burners used in pub. st. lps.	Time of Burn of Public Lamps.
Ashtabula	Ashtabula Gas Light Co	$2 00 15 per cent.—15 days	$2 00 15 per cent. 15 days.				
*Alliance	Alliance Gas Light Co	1 25	1 25	None			
Bellaire	Bellaire Gas & Electric Co	1 20	1 20		$15	4 Feet	Phila schedule
*Bucyrus	Bucyrus Gas Light & Fuel Co	2 00	2 00 20 per cent	None.			
*Coshocton	Coshocton Light, Fuel & Power Co	2 00 15 per cent	1 50 net	None	$2 per 1,000		11:30 pm
Columbus	Columbus Gas Light & Coke Co	1 25 20 per cent. 8 days	1 25 20 per cent. 8 days	None			
Canton	Canton Gas Light & Coke Co	1 35 dis. 5, 10, 15 and 20 per cent.	1 20, 1 15, 1 10 net	450	$15	6¼ Feet	All night
Dayton	Dayton Gas Light & Coke Co	1 25 10 per cent. 5 days, 1 15 net	1 25 10 per cent. 5 days net 1 15	1335	$19	4 Feet.	All and every ligh
Defiance	Defiance Gas Co	10 00 dis. up to 80 per cent	None.	None.			
Delaware	Delaware Gas Light & Coal Oil Co	1 75	1 50	200	{ $12 midnight. { $18 3 a. m	6 Feet	{ Part to midnigh { 3 am sched
Elyria	Elyria Gas & Water Co	2 20, 1 80, 1 60 dis. 20 per cent	1 45 dis. 20 per cent	86	{ $22 all night { $11 midnight	4 and 6 ft.	{ 74 to midnight { night
Gallipolis	Gallipolis Gas & Coke Co	2 00, 2 25, 2 50 and 3 00	1 50	104	$2 per 1,000	3 Feet.	11 pm
Greenville	Greenville Gas Co.	2 00	2 00	127	$25	5 Feet.	All night schedule
Galion	Galion Gas Light Co	1 50	1 00	84	$15	5 Feet.	Midnight schedule
*Hamilton	Hamilton Gas Light and Coke Co	2 00	1 50				
*Hillsboro	Hillsboro Gas & Electric Light Co	1 50	1 50	None			
Kenton	Scioto Natural Gas & Oil Co	1 50	1 50	173	{ 123 at $20, 50 { at $12	6 Feet	All night schedule
Lancaster	Lancaster Gas Light & Coke Co	1 50	1 50	72	$16	5 Feet.	Phila schedule
Lima	Lima Gas Light Co.	1 80 dis. 1 50.	None				
Massillon	Massillon Gas Co	1 50	1 50	None.			
*Mansfield	Mansfield Gas Light Co	1 50 dis. 10 days 1 25	1 25 disc. 10 days 1 00	42	$13	5 Feet.	Midnight to dayli
Mt. Vernon	Mt. Vernon Gas Light & Coke Co	2 50, 2 00, 1 50	Above 1,000 ft. 50 cts.	None.			
Marion	Marion Gas Light Co.	1 50 10 per cent. on 5,000 ft	1 35	None.			
Marietta	Marietta Gas Works	1 25 to 1 80	1 00	None			
Middletown	Middletown Gas Co	1 50 25 cts. dis. on 10,000 and 50 cts. dis. above 10 000	1 50 2 to 5 000 10 per cent. dis. all over 5,000 1 00.	None.			
New Philadelphia	New Philadelphia Gas Light Co	1 75 25 dis. 10 days	1 75 25 dis. 10 days	78	$16	4 Feet.	Moonlight schedu
*Newark	Newark Gas Light & Coke Co	2 25 with dis. from 25 to 1 00	1 00	190	$13	4 and 5 ft.	12 o'clock schedul
Oberlin	Oberlin Gas & Electric Co	1 75, 2 00, 2 25 net	1 50.	37	$15	6 Feet.	10 pm 17 nights
Piqua	Piqua Gas Light & Coke Co.	1 50 with dis. 10, 20, 50 cts.	1 50 with dis 10, 20, 50 cts	None.			
Portsmouth	Portsmouth Gas & Electric Co.	1 50, 1 75	1 50				
Ravenna	Ravenna Gas & Electric Light Co.	1 50	1 50	None.			
*Salem	Salem Gas Light Co	1 50	1 50	None.			
Springfield	Springfield Gas Light & Coke Co	1 50	1 50	813	$20	4 Feet.	All night
*Sidney	Sidney Gas Light & Coke Co.	1 65 dis. 10 days 1 50.	1 65 dis. 10 days 1 50	134	$20	5 Feet.	All night Phila sc
Steubenville	Steubenville Gas & Electric Co.	1 50, 1 35, 1 22 dis. 10 per cent. 15 days.	1 50, 1 35, 1 22 dis. 10 days 10 per cent.	300	$20	6 Feet.	All night
*Tiffin	Tiffin Gas Light Co	1 50	1 50	None.			
*Toledo	Toledo Gas Light & Coke Co.	1 35 dis. 10 days 1 25	Engines 1 13	None.			
Wooster	Wooster Gas Light Co	2 00, 1 50	1 50	None			
Warren	Warren Gas Light Co	1 80	1 80	95	22 50	7 Feet.	12 pm Phila sched
*Youngstown	Youngstown Gas Co	1 50, 1 40, 1 30, 1 20 and 1 00		None.			
Zanesville	Zanesville Gas Light Co	1 25 5 per cent. and 10 per cent. dis.	1 25 5 per cent. dis. small, 10 per cent. dis large	116	1 25 per 1,000	5 Feet.	12 pm. after that schedule

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*Crawfordsville	Crawfordsville Gas & Electric Light Co	$2 net	1 50 net	None.			
*Columbus	Columbus Gas Light & Coke Co	$2 net	$2.	None.			
Elkhart	Elkhart Gas Light & Coke Co	$2 to 1 50 net	1 50 net	155	$20, 12 50	5 and 6	Philadelphia sche
*Evansville	Evansville Gas & Electric Light Co	1 50	Stoves 1 50, Eng. $1				
Fort Wayne	Fort Wayne Gas Light Co	1 50	1 50	None.			
Frankfort	Frankfort American Gas L. & Coke Co	1 50 net	1 40 net	35	19 40	5 and 6	12 pm
*Greensburg	Greensburg Gas Light Co	2 50 and $2	$2	126	$20	4 Feet.	Phila. sched
Goshen	Goshen Gas Light Co	1 25	$1				
Indianapolis	Indianapolis Gas Light & Coke Co	1 25	1 25	2,330	$15	4 Feet.	City sched
Jeffersonville	Jeffersonville Gas Co	$2 dis. 10 per cent	$1 net	None.			
*Lafayette	Lafayette Gas Light Co.	1 40, 1 50, 1 60, 1 70	1 40	18	$20	5 Feet.	All night
Logansport	Logansport Gas Light & Coke Co	1 20 net		225			Not in use
La Porte	La Porte Gas & Coke Co	$2 dis. 5 per cent	$2 dis 5 per cent	95	16 25	4 Feet.	11 pm 15 night in
Michigan City	Michigan City Gas Co.	$2, 1 80, 1 70, 1 60, 1 50 net	1 50				
Madison	Madison Gas Light Co	$2 and 2 25	1 50				
*New Albany	New Albany Gas Light & Coke Co	$2, 1 75, 1 50 net	1 50 net	538	$18	5 Feet.	Phila. sched
South Bend	South Bend Gas Light Co	2 50, with 10, 20 and 20 and 10 per cent. dis.	2 50 with 10, 20 and 20 and 10 per cent. dis				
Terre Haute	Terre Haute Gas Light Co	1 50	1 50				
Vincennes	Citizens Gas Light Co	1 45, 1 70 net	1 45, 1 70 net	232	$36	5 Feet	American Meter
*Valparaiso	Valparaiso Gas & Electric Light Co.	1 50, 1 75	1 50	None.			
Wabash	Wabash Gas Works	3 70	$3	None.			

* Operate Electric Light Systems.

...io and Indiana, February 15, 1890.

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...e of Burning ...f Public Lamps.	No. hrs. public st. lamps burn per annum.	Maintenance and Care of Lamps paid by.	City own or operate Gas Plant.	City or Co. own lamps and posts.	Date of City Contract.	Population.	Capital paid in.	Process of Manufacture.
						8,000	$60,000	
edule		City	No	City		8,000	49,000	Springer Water Gas
			No	City	Dec. '89, two years	10,000	66,000	Coal
			No					Springer Water Gas
		City Light and Ext	No	City own posts		4,000	40,000	Coal
			No	City	No Contract	100,000	720,000	Coal
	2,800	Gas Co	No		April, '88, two years	25 000		Coal
very light	3,674	City	No	City	March, '88, ten years	55,000	600,000	Coal and Water Gas
						9,000	25,000	Patton
midnight, part to n sched		Gas Co	No	City	Dec. '88, five years	10,000	90,000	Coal
midnight, 12 all ht	74 lamps $14 40 each. 12 lamps 43 20 each.	City $34 per Mo	No	City	Mutual	6,000	75,000	Lowe Water Gas
		City	No	City	Yearly	5,000	31,450	Coal
schedule	2,400	City repairs	No	City	1888, seven years	6,000	50,000	Coal
schedule		Gas Co	No		None now	8,000	35,000	Coal
					City bldg. own works.	18 000	61,600	Coal
			No		Nov. '88, five years	4,000	20 000	Coal
schedule		Gas Co	No	City	1886, ten years	6,000	100,000	McKay Water Gas
edule		City	No	City	Yearly	3,000	50,000	Coal
					Expired	18,000	200,000	Springer
			No			10,000	57,750	Coal
to daylight		Gas Co	No	Company	Oct. '89, nine months	20,000	80,000	McKay Water Gas
						6,500	50,000	Coal
			No	City		8,000	37,500	Coal
			No	City		9,000	25,000	McKay Water Gas
			No	City		8,000	73,000	Coal
t schedule		City	No	City	Dec. '85, five years	5,000	30,000	Coal
x schedule		City	No	City	May, '87	18,000	52,200	Coal
nights		Gas Co	No	City	Expired Jan. '90		20,000	Coal
			No	City		10,000	50,000	Coal and Oil and Nat. Gas.
			No			15,000	100,000	Coal
			No	City	Have none	4,000	37,200	Coal
			No			6,000	10,000	Coal
	4,000	City pays repairs	No	City	Nov. '86, five years	40,000	300,000	Coal
Phila schedule	2,125	Gas Co	No	City	July, '89, two years	6,000	30,000	Coal
t	3,200	City pays $600 per year	No	City	Aug. '84, five years	18,000	300,000	Coal
			No	City		12,000		McKay Water Gas
			No	City	Jan. '89, two years	100,000	700,000	Coal and Water Gas
hila schedule		Gas Co	No	Company		7,000	60 000	Coal
			No	City	Yearly	7,000	60,000	Coal
fter that on Phila dule		City	No	City	Mutual	25,000	50,000	Coal

NA.

			No	City	Yearly	10,000	$100,000	Coal
			No	City		8,000	50,000	Coal
phia schedule	34 Lamps, 2,000 121 Lamps, 1,000	City	No	City	Sept. '82, ten years	14,000	50,000	Springer Water Gas
						50,000	60,000	Coal
			No	City	Aug. '84, five years	30,000	225,000	Coal
		Gas Co	No	Gas Co	1885, five years	8,000	50 000	Coal
ched	2,200	Gas Co	No	City	1888, three years	5 000	48,000	Lowe
			No			7 000	27,000	Pratt & Ryan Water Gas
ed	2,740	3 55 per Lamp Co	No	Property owner	July, '88, still in force.	125,000	350,000	Coal
			No			12,000	28,475	Coal
t	3,300	City	No	City		22,000	24,000	Coal
se			No	City		18 000	40,000	Coal
night in mos	1,000	$4 80 per year Co	No	City		10,000	50,000	Coal
			No			12,000	40,000	Coal
			No			10,000	75,000	Coal
ched		Gas Co	No	City	March, '88, 23 years	30,000	100,000	Coal
			No			25,000		Springer Water Gas
n Meter Co. sched	2,200	City	No	City	Dec. '75, 25 years	12,000	50,000	Coal and Water Gas
			No	City		7,000	50,000	Coal
			No			8,000	10,900	Patton's Oil Process
								Naphtha

Prices of Arc and Incandescent Electric Lighting

O

City.	Name of Company.	City own or operate plant.	No. Arc public St. lamps.	Price per year paid by city public arc St. lamps.	C. P. public arc St. lamps	Public arc lamps burn on the moonlight schedule all night.	Public arc lamps burn to midnight only.	System of arc lights.	No. Co mer A Lar
Ada	Ada Electric Light Co	No	25	$75	2,000	1 am		Silvey	
Ashtabula	The Ashtabula Water Supply Co	No	26	60	2,000	12 moon		American	
*Alliance	Mutual Electric Light Co	No	43	72	2,000	12 6 mo, 20 nights Bal		West. E	
Athens	Athens Gas Light & Electric Co	No	32	80	1,200		Yes	T H	
Akron	Akron Electric Co	No	180	3 7-10 cts. per h.	2,000	2 am		T H	
*Bucyrus	Bucyrus Electric Light Co	No	60	100	2,000	Yes		West. E	
Bellaire	Bellaire Gas & Electric Light Co.	No	46	90	2,000	Yes		T H	
Columbus	Columbus Edison Electric Light Co	No							
Canton	Canton Electric Light & Power Co	No	32	108	2,000	Yes		Schuyler	1
Conneaut	Conneaut Electric Light Co	No							
*Coshocton	Coshocton Light, Fuel & Power Co	No	45	77 33	2,000	1 am		Jenney	
East Liverpool	East Liverpool Western Electric Co	No	36	95	2,000	Yes		West. E	
Eaton	Cook & Aydedott	No	Tower 8, 9	150, 100	2,000		Yes	Jenney	
Findlay	Findlay Electric Light & Power Co	No	125	60	2,000	Yes		T H	1
Fremont	Fremont Electric Light & Power Co	No	70	90	2,000	Yes		T H	
Fostoria	Fostoria Light & Power Co	No	40	75	2 000		Yes	Brush	
*Hillsboro	Hillsboro Gas & Electric Light Co	No	62	70	2,000	Yes		T H	
*Hamilton	Hamilton Electric Light Co	No						T H	
Hicksville	Hicksville Electric Light Co	No	6	65	1,500		Yes	Schuyler	
Kent	Kent Water & Light Co	No	40	60	2,000	2 am		Waterhouse	
Lima	Lima Electric Light & Power Co	No	135	88	2,000	Yes		T H	
Lebanon	Lebanon Light, Fuel & Power Co	No							
Lancaster	Lancaster Electric Illuminating Co	No	7	90	2,000		Yes	West. E	
Marion	Marion Electric Light & Power Co	No	67	72	2,000	18 nights 3 am		Schuyler	
Massillon	Massillon Electric Light Co	No	90	70	2,000	6 mo to 1 am, 6 to 2 am		Schuyler	
Marysville	Marysville Electric Light & Power Co	No							
Mt. Vernon	Mt. Vernon Ohio Electric Light Co	No	93	78	1,200	Yes		Schuyler	
Marietta	Marietta	Yes	68	50 Est	2,000		Yes	Jenney	
*Mansfield	Mansfield Electric Light & Power Co	No	82	75	2,000		Yes	West. E	
Mansfield	Richland Electric Light & Power Co	No							
Middletown	Middletown Gas Co	No	45	80	1,200	Yes		Sperry	
Norwalk	Norwalk Light & Power Co	No	82	70	2,000		Yes	West. E	
Napoleon	Beard Electric Light Co	No	16	125 for 12, 100 for 4	2,000	3 am		Beard	
New Lisbon	New Lisbon Gas Co	No	27	80	2,000	1 am and 5.30 am		Brush	
New Philadelphia	New Philadelphia and Canal Dover	No	NP31 CD 35	72	2,000	1 am		T H	
Oxford	Oxford	Yes	36		2,000	Yes		Waterhouse	
Portsmouth	Portsmouth	Yes	96	Don't know.	1,200	Moonlight		T H	
Painesville	City of Painesville Electric Light Co	Yes	68		2,000	2 am		West. E	
Pomeroy	The Pomeroy & Middleport Electric Co	No	25	96	2,000	Yes		T H	
Piqua	Piqua Light & P. Co & Edison E. M. Co.	No	10	100	2,000	Yes		T H	
Ravenna	Ravenna Gas & Electric Light Co	No	50	75	2,000	Extra pay		T H	
Steubenville	Steubenville Gas & Electric Co.	No	23	75	2,000	Yes		West. E	
*Salem	Salem Electric Light Co	No	11	70	1,200	Yes		Waterhouse	
Tiffin	Tiffin Edison Illuminating Co	No							
*Tiffin	Tiffin Electric Light Co	No	116	88	2,000	Yes		West. E	
*Toledo	Western Electric Light & Power Co	No	250	100	2,000	Yes		West. E	1
Toledo	Toledo Electric Co	No	250	100	2,000	Yes		T H	3
Van Wert	Citizens Electric Light & Power Co	No	53	84	2,000	Yes		T H	
Wellaville	Citizens Electric Light & Power Co	No	40	70	2,000		Yes	Waterhouse	
Wooster	Wooster Schuyler Electric Light Co	No	69	70	2,000		Yes	Schuyler	
Washington C. H.	Washington Electric Light, Heat & P. Co.	No	51	80	1,200		Yes	T H	
Youngstown	Mahoning Electric Light Co	No	184	70	2,000	Yes		T H	1
Zanesville	Zanesville Electric Light Co	No	150	87 50	2,000	12 pm moon after		West. E	1

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*Crawfordsville	Crawfordsville Gas & Electric Light Co	No	73	71 43	1,200	3 am		T H	
*Columbus	Citizens Electric Light Co	No	48	52 12½	2,000		Yes	T H	
*Evansville	Evansville Gas & Electric Light Co	No	169	120	2,000	Yes		Bush	1
Fort Wayne	Jenney Electric Light & Power Co	No	146	129	2,000	Yes		Jenney	2
Frankfort	Citizens Electric Light Co	No	40	68			Yes	T H & A	
Goshen	Goshen Electric Light & Power Co	Yes	27	Don't know.	2,000	Yes		West. E	
Kokomo	Kokomo Electric Light Co	No	50	100	2,000	Yes		T H	
Logansport	Jenney Electric Light & Power Co	No	76	100	2,000	Yes		Jenney	
Lafayette	Brush Electric Light Co	No	223	50 40	1,200		Yes	T H	1
*Lafayette	Lafayette Gas Light Co	No							
*New Albany	New Albany Gas Light & Coke Co	No						American	
South Bend	South Bend Electric Co	No	100	100	2,000	Yes, 40		West. E	
Terre Haute	Terre Haute Electric Light & Power Co	No	235	70	2,000		Yes	T H	1
*Valparaiso	Valparaiso Gas & Electric Light Co	No	40	67 50	2,000		Yes	West. E	
Vincennes	Vincennes Electric Light & Power Co	No	5	96			Yes	T H	
Wabash	Wabash Electric Light Co	No	12	75	2,000		Yes	T H	

* Operate Gas Plants.

ting in 69 Cities of Ohio and Indiana, February 15, 1890.

OHIO.

No. of Commercial Arc Lamps	Price per month for commercial arc lamps.	No. of Incandescent st. lps.	Price per yr. paid by city pub. Incandes't st. lamps.	C. P. incandescent St. lamps.	No. of incandescent commercial lamps.	Price per month incandescent commercial lamps.	Use Meter?	System.	Date of city contract.	Natural Gas as Fuel.	Population.	Capital Paid in.
					550	16 c p 80c, 50 c p $2, 100 c p $3	No	Silvey.	Jan. '89 5 years	Oil.	2,500	10,000
20	$7 for 1, $6 2 or more								With water works.	Coal.	10,000	
63	10 50								3 years.	Coal.	8,000	38,000
4	$7								Oct. '89, 3 years	Slack.	3,500	36,000
23	$7 to 10 pm, $8 to 12 pm									Coal.	30,000	100,000
9	$8 to 12 pm								Aug. '89, 1 year.	Oil	7,000	
									Dec. '89, 2 years			66,000
185	From $5 to $9				9,100	16 c p	Yes	Edison.		Coal	100,000	200,000
		10	$18 per yr.	32	1,500	16 c p 1 cent per hour	Yes	Edison, 3 Wire		Slack.	25,000	100,000
28	Average 5 82				275	20 c p from $1 to 62½c.					3,500	10,000
32	Average $6 to 10 pm.								Dec. '89, 5 years.		4,000	40,000
13	$5 to 10 pm.				150	16 c p $5.			Feb. '89, 3 years.	Natural Gas.	12,000	22,000
110	$6.				200	32 c p $1.	No		Dec. '86, 5 years.	Coal and Oil.	4,000	17,000
60	5 50 to 10 pm, 6 50 to 2 am				500	16 c p 60c	No	T. & H. altern'g	July '88, 5 years.	Natural Gas.	20,000	Not Incorp.
25	7 50								Jan. '90, 5 years	Natural Gas.	12,000	60,000
										Natural Gas.	8,000	
26	$8 to 12 pm.				90	16 c p $1	No		Nov. '88, 5 years	Coal.	4,000	
27	$6 to 10 pm, $9 to 12 pm										18,000	50,000
						16 c p 76c			June '89, 3 years.	Wood and Coal	2,500	9,600
1	6 25.				507	25 c p 1 12½	Yes	Westinghouse	Jan. '89, 5 years.		5,000	
						50 c p 2 25.						
70	$10.				1,500	16 c p $1			Oct. '89, 3 years.	Natural Gas.	20,000	
		166	$20.	25	350	16 c p 75c.			April '89, 5 years.		3,000	40,000
40	7 50 to 12 pm, 6 25 to 10 pm									Natural Gas.	8,000	14,000
45	6 50 to 9.30 pm, $8 to 12 pm				250	30 c p 85c, 1 lamp 3 40	No	Heisler.	5 years.		10,000	25,000
90	6 75 average.				600	$1 to 1 50.	No	Edison.	'89, 5 years.			50,000
		103	$16 to 2 am.	32	2,000	16 c p 75c to $1	No	Edison.	March '89	Oil.	3,500	Not Incorp.
40	$6 and $4.								Feb. '89, 5 years		6,000	35,000
											8,000	13,000
24	$9, $8, $7.								March '87, 5 years	Slack.	20,000	25,000
					700	75c average	Yes	Westinghouse.		Slack.	20,000	16,000
									April '89, 5 years.		8,000	
24	$6.								Jan. '86, 5 years.		10,000	25,000
					40	16 c p 75c			Nov. '88, 3 years		3,000	
					450	16 c p 75c	No	Edison.	Oct. '88, 5 years.	Natural Gas.	3,000	21,000
20	6 25.								Dec. '89.		8,000	
		12		50	1,053	16 c p 1c per hour	Yes	Westinghouse.		Oil.	2,000	
											15 000	
											6,000	
50	$6.								Oct. '89, 5 years.		9 000	30,000
25	7 50	250	$18.	20	1,500	Contracts	Few	Edison.	Oct. '89, 5 years.	Natural Gas.	10,000	65.000
									Jan. '90, 2 years		4,000	37,200
41	6 50.	184	$20.	25	1,400	16 c p 2 25, 1 12, 75c	No	Westinghouse.	Feb '89, 5 years		18,000	300,000
		290	$12.	25	900	16 c p 50c to 1 50	Yes	Westinghouse.	April '88, 5 years.			
					1,600		Yes	Edison.		Natural Gas.	12,000	27,700
36	$6 and $5.								May '88.	Natural Gas.	12,000	
100	25c to 12 o'ck, 40c all night						No		Jan. '89, 5 years	Natural Gas.	100,000	200,000
300	ditto				2,000	16 c p $1	No	T. & H. altern'g	Jan. '89, 5 years.	Natural Gas.	100,000	176,500
25	$7 8 hours, $8 all night.				650	16 c p 85c	No	T. and H.	Dec. '89, 5 years.	Natural Gas.	6,500	20,000
17	5 50 to 10 pm.				40	16 c p 50c			Dec. '89, 1 year.	Natural Gas.	6 000	12,500
28	$6 average				379	16 and 20 c p average 75c	No	Edison.	Jan. '88, 10 years.		6.000	25,000
25	5 50.						No		Oct. '89. 6 years		8,000	10,000
112	7 50, 8 33, $10.						No		Dec. '89, 3 years.	Natural Gas.	30,000	
135	$6 average										25,000	75,000

INDIANA.

53	$10, 8 33, 6 25				24	50 apd 75 c p, 10c per day	No	T H and B.	Aug. '87, 3 years.	No	10,000	$100,000
30	$6 and $7.								Dec. '89, Expires.	No	8,000	15,000
100	6 25 to 7 50.				2,500	16 c p 25c, 40 and 50c	Cons. furn. meter	Westinghouse.	Aug '85, 10 years.	No	50,000	600,000
300	$8 10 50				1,500	16 c p, 1c per hour	Yes	Slattery.		No	45,000	
50	$5.									Yes	8,000	24,000
					750	16 c p, 50c to 85, 25 cp, 95 to 1 25	No	National.		No	6,000	15,100
38									March '90, 3 years.	Natural Gas.	10,000	13,000
20	7 50 to 8 33⅓				422	16 c p, 75c to $1, 1 25, 1 50, 2 25.	No	Slattery.	Jan. '90, 5 years.	Natural Gas.	18,000	16,500
125										Natural Gas.	22 000	
					40	100 c p, 2 25.	No	T H		Natural Gas.	22,000	240,000
51	6 25, 8 33⅓									No		
40	6 50.								1890, 5 years		22,000	18,000
150	7 50 to $15.				600	20 c p, 1 50	No	T H		No	40,000	50,000
14	6 50 to 8 50								Nov. '88. 5 years.	Oil.	7,000	50,000
23	$6 to $8	131	$24	30	150	60 c p, 2 50, 45 c p, 1 90 / 32 c p, 1 25, 30 c p, 1 75	No	Heisler.	1886, 5 years.	No	12,000	20,000
31	$5 and $6.	121	18 11	30	150	16 cp. 65c, 20 cp, 75c, 30 cp, $1 / 45 cp, 1 25, 100 cp, 2 25	No	Heisler.	Jan. '88, 5 years.	Natural Gas.	6,000	10,000

SUNDRY MATTERS.

Mr. Printz—I would like to say that the committee on location of the next place of meeting would be pleased to receive applications from any member who would like to have the meeting in his city.

The President—You hear the request of the Chairman of the Committee. The next place of meeting is, of course, a matter of importance to us, and will have to be settled before we finally adjourn. I trust it can be settled to the satisfaction of the Association at large.

The Secretary—Mr. President, by resolution this morning the matter of the consideration of the question of providing for a legislative committee for the ensuing year was deferred until after these papers on municipal control had been read and discussed. I simply call your attention to the fact that this is the time for any action on that subject.

The President—A resolution would be in order that shall be expressive of the sentiment of the Association in this regard; and, for my own part, as it seems to me that an Association of this kind should have some such organization in connection with its movements, I will recommend that some step be taken in reference to this. If any one has a resolution to offer that shall meet the requirements, now is the time to present it.

Mr. Printz—Mr. President, I don't believe that there were many of us who fully understood the subject when it was up this morning, and I think the Committee have failed to make a full report, or didn't appear to know what they were wanted to act upon. As theyhave given the matter some study, I think it would be well to have the same members continued on that committee.

The President—The report of the committee is to the effect that, in their judgment, their powers and duties are not sufficiently or accurately enough defined; that is one thing. The whole thing indeed seems to be rather vague, and yet there seems to be a pretty thorough idea engrafted upon the mind of the Association at large that there is need of a committee of that kind. I believe that some questions have come up during the present year, when inquiry was made about the legislative committee. I was chairman of the committee, but I could see no possible opportunity for us to take any action in connection with that matter. A conference with the members of the committee also failed to elicit anything, so we were completely at a loss to understand just precisely how far our duties might extend A report was made that certainly was vague and rather indefinite, but it was all that could be reported under the circumstances. Action was taken this morning that made this matter come up at this time, but if the body wishes further time to consider it, I think there is no impropriety in simply dropping the matter at the present time and bringing it up further on. If the Association so desires it, of course a resolution is in order.

Mr. Graeff—Mr. President, I suppose nearly every member of this Association knows that the electric light people are paying close attention to this matter. A year ago, at their National Convention at Chicago, they appointed a committee, giving the chairman of the committee power to choose his fellow members to give attention to this matter during the coming year. As a result about a dozen state associations have been formed among the electric lighting companies with the sole purpose in view, of guarding the electric lighting interests against adverse legislation. These associations are formed by the companies, not by individual members. They are banded together for mutual protection, as I say, against adverse legislation. The National chairman (Mr. A. R. Foote) of this electric light committee, will probably be here to-morrow, and I think if we would lay this matter over until then that he could probably tell us more particularly wherein lie the dangers that we will have to look after, and which we must guard against. He can probably give us suggestions which it will be wise for us to heed. I, therefore, move you that action on this matter be postponed until to-morrow morning. [Adopted.]

Mr. Cantine—While this matter is before the house I would like, Mr. President, to make the suggestion that very few who are connected with this Association (and possibly the same may be true of the electric light association) have legal minds, and it would be a very nice thing for us if our committee were empowered to employ, in any case of emergency, a first-class constitutional lawyer. Now in Mr. Gemuender's paper which our Secretary read, when the outsider called the engineer's attention to the fact that there was a hole in his boiler, he was very indignant that any person should interfere with his business, but he felt confident that he himself had sufficient ability to legislate. That class of people don't know much about legislation, but if we had a first-class attorney to take care of our interests, who was, like the Michigan peddler, "just middling honest," we would get along with this matter in that way better than with any committee. In case of any proposed legislation we don't know what effect the constitution would have upon it—whether it would be constitutional or not. If it would not be effective, a good constitutional lawyer would say the act would be not worth the paper it is written on, and he comes up and makes his argument, and that is generally the last of it. I think that is the best way to get rid of any obnoxious legislation—to show what its effect would be; to show that it would not be good for anything, and that would be the end of it.

Mr. Penn—I think Mr. Cantine is right. We organized an Electric Light Association in Columbus, and the Executive Committee was authorized to employ a lawyer to look after our interests. They have employed a lawyer temporarily, until our permanent organization could take place in May. We took the same ground that Mr. Cantine has taken.

The President—Mr. Hedges not being here, we will now call upon our Secretary to read his paper.

The Secretary then read Mr. W. C. Hedges' paper, which was on the subject of

OHIO STREET LIGHTING STATISTICS.

Mr. President and Gentlemen of the Ohio Gas Light Association—What is popular opinion to-day may become unpopular opinion to-morrow. The subject of "Street Lighting Statistics," suggested to the writer, as regards the State of Ohio, by your Secretary, is one of the great questions of the day that interests gas men, not only of our own America, but of foreign countries likewise.

Circulars having been mailed, with a series of questions relating to city and commercial lighting, to eighty gas companies doing business in Ohio and Indiana, and general and aggregate statistics of the companies responding having been made up, the members this Association will receive a copy of the same by applying to the Secretary.

We find thirty-five cities reported from Ohio, with a population ranging from six thousand and upward. The average net price to to private consumers for illuminating gas in these cities is $1.48 per thousand cubic feet.

Also, in thirty-one cities, ranging in population as stated, the average net price to private consumers for gas used by stoves and engines is $1.33⅓ per thousand cubic feet.

Of the forty-one gas companies responding to the circular, five fail to note the number of public street lamps in use. Eighteen companies report 4,436 public street lamps, making an average of 246⅔ lamps per company. Eighteen report no public street lamps in use. Twenty-two failed to report size of burners used in public street lighting. Nineteen give full report, showing, by average, that public street lamps burn five cubic feet per hour. Twenty-one companies fail to report as to the maintenance and care of lamps. Twelve reports said maintenance and care reported by the city. In eight of the cities this expense is borne by the gas companies.

It might be well to here call your attention to the fact that only two gas companies report that they are the owners of the lamps and posts connected with their works. One company is owner of lamps only. The cities where balance of companies are located are the absolute owners of lamps and posts. Twelve gas companies are owners of electric light works.

It is very interesting here to note the fact that most of our cities have their streets illuminated by the electric arc system, at an enormous expense, far exceeding the price of gas for street lighting.

As my design in preparing this brief recapitulation is simply to introduce the subject for discussion, I will now leave it to each one of you to deduce, from the gas and electric lighting charts accompanying this memorandum, the fact that the tread of the world is toward gas for light and fuel.

Discussion.

The Secretary—Mr. President, I would like to call the attention of the members, for the sake of having anything of this kind perfect in the future, to the fact that the value of these charts, upon which there has been considerable labor and expense, would be very much greater had the companies all freely responded to Mr. Hedges' circulars, and taken the trouble to fill out the blanks in detail. They are very imperfect. Some companies did not respond at all.

The President—Gentlemen, this matter is before you, together with the charts, and the suggestion of the Secretary, which I consider a pretty important point.

Mr. Printz—I think we certainly owe thanks to Mr. Hedges for the time and care he has taken. Certainly, the charts are very interesting, and yet I don't see how we can do very much in the way of discussion until we have had time to read them and examine them. At the same time I feel under very great obligation to Mr. Hedges for preparing them, and I move a vote of thanks to him. I did not wish to cut off discussion by making this motion. [Adopted.]

The Secretary—Mr. President, while we are on the subject of street lighting I will mention a matter of possible interest, simply—it could hardly be classed as discussion of this paper and these charts—that Columbus is lighted very lavishly and extravagantly with electric arc lights; that the lighting there costs about $63,000 per annum, which is equivalent to over 60 cents per year for every man, woman and child in the city. The Gas Company, in conjunction with the Oil Lighting Company, there, have canvassed the matter very thoroughly, and have ascertained they can make a bid for lighting the city, leaving the electric lights on all the street car lines in the city and other central streets, at an expense of $48,000 per annum, saving the city $15,000 per year, and the city would be as satisfactorily lighted as at present. Notwithstanding that, I have very little hope of our getting such a contract made.

Mr. Printz—I would like to ask Mr. Butterworth if he has any objection to giving the Association the benefit of experiments he has made with Gordon lamps for lighting streets?

The Secretary—Well, that part of the results that will be interesting to you is simply that the lights were very much admired by the council committee on gas and lighting, and by citizens; and that is about as far as it has gone. The council committee on lighting claim that they cannot entertain a proposition from us for

lighting the streets, or cannot enter into any contract for the lighting of the streets, on account of the Burns law. That blocks all further discussion. The matter has come to a crisis there at present though, as some of you are probably aware. It might be interesting, if it would not take too much time, to detail the circumstances. A certain attorney had a bill against the city for services rendered. I do not know the terms of the bargain under which he performed these services, but the city declined to carry out the contract, or to pay him for the services rendered, because the Burns law rendered the contract nugatory. He said, "Gentlemen, if you refuse to pay this on account of the Burns law, I shall get an injunction on the electric light company's lighting the streets, which you are having done in violation of the Burns law." There was no money in the treasury when the contract was entered upon. He also enjoined the city from paying the Assistant City Solicitor for the same reason, and so the night before I left Columbus the streets were in absolute darkness. I don't know how they were last night. The matter will certainly have to be passed upon soon, one way or another, because the people won't go without light.

On motion, the meeting adjourned to 8 P.M.

FIRST DAY—EVENING SESSION.

The President—I will call your attention to the 13th question on this supplementary list: "*Is plate steel or cast iron the better construction for purifying boxes?*" That is a matter of considerable importance. At least I have recently had my own thought directed to it by others, as well as by natural impulse. We have here on the table an exhibition of the use of wrought iron in a stand-pipe, and the question as to its use in other constructions—purifying boxes, for instance—is one that ought to bring out information that should be valuable to us all. I presume no one would object to getting some information as to its value, not only for purifying boxes, but for stand-pipes and perhaps dip-pipes. I recall the fact that the new works at Cincinnati required a very general overhauling, so far as the dip-pipes were concerned, a very short time after they went into operation.

Mr. Hyde—Our new boxes, the boxes themselves, are made of cast-iron, the covering, of course, being of sheet-iron.

The Secretary—Did you consider the use of steel at all?

Mr. Hyde—No, sir; not in ours. We made our hydraulic main and the stand-pipes on one side of the house with wrought iron, and on the other side of the house the stand-pipes are cast iron. We tried to see which was better. We put up a thirty inch main in the condenser room of steel, but seeing that sample up there, and some other things that have occurred, I almost wish we hadn't done it. I don't know what the result is going to be, but I don't think I would be in favor of using it again.

The President—What are your dip-pipes?

Mr. Hyde—I don't recollect, but I think they are cast iron. The hydraulic is wrought iron or steel. Mr. Bredel put them up.

Chair—If I mistake not, Mr. Evans has some practical knowledge in the use of wrought iron mains, and possibly his knowledge may extend beyond that.

Mr. Evans—Mr. President, I have never seen any deterioration in our mains that would lead me to act any differently in putting in mains. In fact I don't think the wrought iron or steel would be affected. I see no reason why, if you get rid of the sulphur, it should be acted upon any quicker than cast iron; but I believe where heat and moisture exist with sulphur that the sulphur acts upon the iron to a greater or less extent. I don't know of any place where wrought iron or steel boxes are in use now except the covers.

The President—To my mind the New York Gas Light Company has a set of steel boxes. I would not assert it, for I am not positive about it, but as memory serves me they are steel boxes, lined with cement. I think Mr. Hyde was with me at the time. I don't know whether he remembers that or not.

Mr. Hyde—I don't recollect about it.

The President—I noticed it more particularly on account of that cement lining. I think they had been in use then some two or three years.

Mr. Webster—I believe we have used a set of wrought iron boxes five years. I don't see any giving out to them, or anything that would indicate anything of the kind. That is the extent of the time we have used them. I don't know how long they are going to last; but I don't see anything about them that indicates any wear.

The President—You say wrought iron—do you mean wrought iron or steel?

Mr. Webster—I think they are heavy boiler iron. That is my impression. They probably may be steel but am not positive. They are riveted together in pieces, the same as boiler iron.

The President—That is valuable testimony. An economic question comes in there that might be of a good deal of importance in a large works.

Mr. Cantine—Most works have plate iron or steel covers that seem to last pretty well, having just as hard usage and being subject to just the same deterioration that the sides and bottoms have. If the covers last, why should not the sides?

The President—In my own experience the covers would not last as long as good heavy cast iron.

Mr. Cantine—That is true, but we have all used them for twenty years without finding any holes in them. I know that is my experience. They are not over three-sixteenth of an inch thick, and had it been good three-eighths steel, the ordinary American citizen would not live long enough to have seen a set worn out.

Mr. Wilkiemeyer—I have no experience with steel, but with wrought iron I have some little. I took charge of a set of works one time, and when I came into the people's houses they had their doors open to get rid of the foul gas. When I examined into the matter I found that it was caused by the purifiers all being rusty, and I had to build cement walls around the inlets and outlets so as to purify the gas for a certain length of time until I could put in the wrought iron boxes, which I had to buy at once. When I took out the sheet iron boxes I could tear them in pieces like a rag.

Mr. Clark—We have a purifying box, twelve feet square, that has been in constant use since 1878, and I don't think we have ever paid out a dollar of expense on repairs. We have simply kept it coated well with paint. I was examining it the other day, and I saw no trouble with it except one or two rivets. We had it coated over with paint and I think to-day it is good for many years more I think the top is three-sixteenths. It was a second-hand box, purchased in Philadelphia. In fact, our works were mostly second-hand works purchased in Philadelphia.

The President—You are speaking particularly of the lid being wrought iron?

Mr. Clark—The lid.

The President—You don't mean the body of the box?

Mr. Clark—Yes, the lid and the sides. That is the outside. The water-seal is wrought iron. The inside is cast iron, bolted together in sections, but the outside I think is wrought iron.

The President—I will read the 14th question: "*What treatment or care secures the longest life of a purifying box lid?*"

The Secretary—At Columbus we aim to keep the sides of the lids that dip into the water painted frequently. The part of the lid, of course, that rusts first, is right at the water line. We aim to keep a little "oil on the troubled waters" all the time, to prevent rusting.

Mr. Hyde—Crude petroleum put on to the sides where it dips into the water, or near the water line that Mr. Butterworth speaks of, is a thorough preventative of rust, inside and outside. Apply it occasionally, so that it keeps oily, and it cannot rust. Crude petroleum is the best thing that can be used.

The President—We have practiced, for a number of years and with a great deal of satisfaction, this method. We have taken some little pains to make these surfaces pretty clean, however, and then painted them over, as Mr. Hyde says, with crude petroleum, with a very decided advantage. Perhaps some of these questions may seem, at a glance, unimportant, because they are presented merely as questions. But any one of them would form a good subject for a paper.

Mr. Faben—Instead of painting the oil on, if the oil is merely put into the seal, the cover, in coming up, comes out of the oil last, and in going down enters the oil first; and maintains a constant coat inside and outside.

The Secretary—We put the oil on the surface of the water.

Mr. Geo. A. Light, of Dayton, then read his paper entitled—

ADVANTAGES OF A COMBINED COAL AND WATER GAS PLANT.

Mr. President and Gentlemen of the Ohio Gas Light Association—The subject I am to write upon is one that has received considerable attention, and I do not think I can furnish more information than has already been given in the Gas Light Journals, but I will try.

The gas company that manufactures a gas of fourteen to sixteen candle-power, can no longer satisfy the consumer. He wants something better for less money, and if the gas company can not furnish this he will try something else, and that something else is usually electric light. So the question is, "What is the best and cheapest plan of increasing the candle power of gas?"

There are several ways, but the water gas process is acknowledged to be the most satisfactory method of making a high candle power gas.

By using Lima crude oil in a water gas plant, gas can be made of a high candle power, say thirty candles, at less cost per thousand feet than by any other method. A coal gas plant can be run more satisfactorily, and the gas made at considerable less expense, where a water gas plant is being run in connection with it. No idle benches on Sunday or Monday, no extra benches under slow fire, ready for sudden increase in consumption. The variation in the output is supplied and controlled by the water gas plant. For instance, we will suppose the average daily consumption is 500,000 feet. The coal gas plant has four benches of sixes and four benches of fives, making 300,000 feet of sixteen candle-power gas per day. The water gas plant consists of two sets of Granger generators and superheaters, capacity 400,000 feet of thirty candle power gas per day. The 200,000 feet of water gas that is required to make up the daily output of twenty-two candle power gas, can be made in the daytime by running both sets (this I consider the best plan), reversing the night watch for extra work. If the output should suddenly increase on account of several successive dark days, the required amount of gas can be made and kept on hand by running an hour or two extra at night; or, if the increase be a gradual one, the extra gas required can be made at night until your increase in consumption justifies starting another bench.

When the output of a water gas plant making 30-candle gas is more than two-fifths of the total amount of gas made by the com-

bined plants, the candle power can be regulated by the amount of oil used per 1,000 cubic feet of gas.

In a city or town where natural gas is in general use it is a difficult matter for a coal gas company to dispose of coke at the price obtained for it before the introduction of natural gas.

The water gas plant is then a good customer for the coal plant. It decreases the amount of coke made and helps to keep up the price of that you have for sale by using a considerable amount of it. It requires 45 pounds of coke per 1,000 cubic feet of gas made (coke made from Youghiogheny coal).

An engineer or superintendent of a coal gas company, who has a water gas plant in running order, does not lie awake at night, planning how he will overcome the trouble his stokers are causing in the retort house, or will cause him by striking at the time he is least prepared for it. The water gas plant is the best "peacemaker" that I know of. The stokers know, or if they don't know, very soon find out that, in an emergency, two men in the water gas plant can make as much gas as twelve men in the coal gas plant, and that it requires but one skilled man for each watch, and they are generally old and tried employees.

Discussion.

Mr. Light—Now gentlemen, the reason I did not make this paper any longer is because the last issue of the AMERICAN GAS LIGHT JOURNAL contains two articles which I think thoroughly cover all the ground.

The President—You have heard a brief presentation of facts from the experience of one in daily practice. I trust the points thrown out may be the nucleus of a discussion that will be valuable to us in this connection.

Mr. Penn—I would like to ask Mr. Light if he would think it advisable for a small town like Washington Court House to put in water gas plant?

Mr. Light—Yes, abandon your coal gas plant. That is what we have done at Piqua.

The Secretary—Which costs the more in the holder, coal gas or water gas?

Mr. Light—Water gas.

Mr. Booth—What sized generator do you use?

Mr. Light—We have two. I think they are called six foot generators. I don't remember the exact size—I was trying to think of it this afternoon. It is a seven-foot shell.

Mr. Booth—What amount of gas do you produce to each run?

Mr. Light—Between 3500 and 4000.

Mr. Booth—Do you fire up every 15 minutes?

Mr. Light—No, we run ten minute runs—blow ten minutes and make gas ten minutes.

Mr. Booth—Can you get up heat in ten minutes?

Mr. Light—Yes, sir, with coke made from Youghiogheny coal. You cannot very well with hard coke.

Mr. Booth—That is your gas house coke?

Mr. Light—That is coke that comes out of our retorts.

Mr. Booth—At Bellair we have the Crichlow process.

Mr. Light—We have the McKay-Crichlow at Piqua, and we have a Granger at Dayton.

Mr. Booth—Ours was put up for a natural gas plant. In running natural gas there we would run thirty minutes.

Mr. Light—We don't use any natural gas at Dayton, but when I left we were preparing for it.

Mr. Booth—It would require about thirty minutes to get up a heat. Once in a while the natural gas would fail us, and we would get short. We would then make water gas and run about ten to fifteen minutes, but it took us longer than the time you specify to get up heat, and our experience was that it cost as much or more to make water gas as it does coal gas.

Mr. Light—With our Piqua plant we can make gas a great deal cheaper. We have one difficulty there, we can't sell coke at a reasonable price. We have between six and seven thousand bushels of coke there that they are using up in that way.

Mr. Booth—There may be a misunderstanding as to what I mean in regard to its costing more than coal gas. When we deducted the receipts from coke and tar from the cost of the gas the coal gas was cheaper than the water gas.

Mr. Light—Are you comparing candle power?

Mr. Booth—Well, you might have a little higher candle power.

Mr. Light—I think if you bring your coal gas up to 22-candle power, you will have to use cannel coal as an enricher.

Mr. Booth—We always made our ordinary coal gas of 16 or 17 candle power, except when we ran the Crichlow process, when we got a higher candle power.

Mr. Light—At Dayton we had to come to it or let the electric light get ahead of us.

Mr. Booth—At the present price of coke and tar I think coal gas, unless the coal costs too much, can be made at least as cheap as water gas.

Mr. Light—Have you natural gas in your town?

Mr. Booth—No, not much.

Mr. Light—You say you have a market for your coke?

Mr. Booth—Since natural gas has failed we sell our coke to the glass houses and cannot produce enough of it. We sell it cheap compared with what they do in some places. We only get four cents at the works. Of course the glass house hauls it away.

Mr. Light—We get ten and twelve cents in Dayton now for what we do not use up. Of course we could not get that unless we were using a good deal of it up in the water gas plant.

Mr. Rood—The gentleman spoke of using natural gas in the manufacture of illuminating gas. What proportion of natural gas can you use to advantage in making illuminating gas?

Mr. Booth—That is a question that I don't believe I can answer.

Mr. Rood—What effect upon your gas does an excessive use of natural gas have?

Mr. Booth—It will weaken the candle power, of course. If you use too much natural gas your candle power will be that much decreased. We aim to use, I believe, about 3 to 4 gallons of oil to the thousand feet produced, but when natural gas went through it was not measured. We opened the pipe.

Mr. Rood—Is it possible to enrich the natural gas passing through your generators so that it will make illuminating gas as acceptable as water gas?

Mr. Booth—Well, I never could discover any difference in the quality of the gas when you use the natural gas, from what it is when making straight water gas. Very frequently the natural gas would fail, so that we had to make half runs with water gas. Some days, altogether water gas.

Mr. Rood—Is it much cheaper to use natural gas in manufacturing your gas, than to make pure water gas?

Mr. Booth—There is not much difference. Of course we paid a pretty heavy dividend to the natural gas companies in order to get the natural gas.

Mr. Rood—What did you pay per thousand feet?

Mr. Booth—We paid twelve per cent. of our gross receipts. We did that to keep them out of the field.

Mr. Rood—Then you would not consider the use of natural gas a great advantage in making gas?

Mr. Booth—It was not in our experience. It cost more than coal gas, as I said, after deducting the price we got for the residuals.

Mr. Rood—But you made a gas of higher illuminating power?

Mr. Booth—Yes. We haven't run, however, for nearly two years, because we didn't get enough natural gas. We had to have pressure enough to force it into the holder. Whenever it got below that it would go back into the pipes, and we didn't think it good policy to make gas to go back into the natural gas mains, so we stopped.

The President—I see Mr. Faux is here, who, I think, can give us some experience in this direction that would interest us.

Mr. Faux—Mr. President, I came here to be a listener—a looker-on. I did not expect to have a chance to give my experience in this matter, but as it has been brought out I feel like saying something. In the matter of enriching natural gas, my experience is quite extensive. We spent a great deal of money, and tried to make it a success. I found that by using a small portion of natural gas there was no trouble in getting candle power, but if you used over a certain amount of it your gas would be smoky and red; and you couldn't hide it, no matter how much steam you put in it. For outside purposes, such as street lighting, it was very poor. Just as soon as the least draft of air would strike it, it would go off in a blue blaze. Of course people soon found out what did that. We tried that about a year. We used 5, 10, and sometimes 15 per cent. to see whether we could get anything out of it. We got the natural gas part of one year for 1.9 cents per thousand feet, through the station meter; that is, we paid the natural gas company 1.9 cents per thousand for every thousand feet of gas that we made that went through the station meter. The second year we paid six cents per thousand feet for natural gas. But we abandoned it entirely, from the fact that we could not make a success of it. As far as candle power was concerned, it was all right. I find other parties are using it, but I speak from my own experience only. The gas was not satisfactory to ourselves. This matter of water-gas comes up here, and I am glad it has been brought up. I am in the same position. Three years ago I took charge of the works on the Southside. They were using what I call a number one coal—that is, the best lump. They were paying $1.54, I think, per ton, delivered. I looked over the matter—I was sent from the eastern part of the State—and my figures were set—that I must put gas in the holder at a certain price. I looked over this matter and found I couldn't do it with coal at $1.54, and coke at three cents a bushel after it was crushed and screened. I thought I would try another coal. I think that cost me about $1.25. My results were not satisfactory. The gas still was costing too much in the holder. I then came to the conclusion that, as I had this water gas plant, I would try something different. I tried 2,000 bushels of slack, just this common slack that they screen from the mines, and I found that I could get a pretty good yield out of it and by using a small quantity more of oil I could get the desired candle power. So instead of using $1.54 coal I am to-day using 50 cent coal—costing me fifty cents delivered at the works—and with about ½ or ¾ of a gallon of Lima crude, which costs me now 65 cents a barrel, I have my desired candle power, which runs from 22 to 24. All this is done with the aid of a water gas plant. If I hadn't this water gas plant I could not nearly get that candle power. So I think, in works of ordinary size, where they can combine the two, the water gas plant is the thing.

The President—What yield do you get from that slack as compared with your inch and a-half screened coal?

Mr. Faux—Well, I regulate that a little bit to suit myself. I can get all the way from 3.50 to 4.44 feet. If I am a little short of gas, I set the exhauster up pretty heavy. If I don't need the gas, I go the other way on the exhauster, about three-quarters of an inch. If my gas is poor from that slack, I just push in a little bit more oil at the other end.

Mr. Rood—The gentleman said he used different proportions of natural gas. What proportion of natural gas did you find you got the best results from?

Mr. Faux—When I used about five to eight or ten per cent., not over that, I could get fair results; but it didn't matter what the candle power was, as soon as a gust of wind struck it, it told on it, from the fact that there was no weight in it. It would blow off in a blue streak. For inside lighting, where there was no wind, it was very nice, but outside in the street it was not good. Our street lamps there are very peculiar. They have no bottom in them, as I say. It is so that the lighters can do the lighting with a stick. A draft of air would blow the lights out, and we had more "outs" when we were using natural gas than we have had since.

Mr. Rood—Did you find that five to eight per cent. of natural gas is an advantage?

Mr. Faux—Well, I don't know. It would depend considerably upon the price you could buy your natural gas for. If you could buy it cheaper than you could make coal gas, it would be an advantage. Otherwise, I don't think it would be.

Mr. Rood—Would it be of advantage to pay twelve cents a thousand feet, and use it in that plant?

Mr. Faux—That would depend upon the cost of coal in your locality.

Mr. Rood—Suppose you were not making coal gas at all, but were making water gas.

Mr. Faux—Then it would be an advantage, because your natural gas will run—well, our Pittsburgh natural gas is about eight candles. That is about the general run of it. We have that eight candle gas already made for that twelve cents and I don't think you can make water gas of eight candle power for twelve cents.

The Secretary—Mr. President, at Richmond, Indiana, Mr. Starr tells me that 25 per cent., by volume, of the gas in his holder is natural gas, and 75 per cent. water gas. He uses three gallons of oil to the thousand feet, enriching it, and he and his consumers are very well satisfied.

Mr. Rood—What candle power is his illuminating gas?

The Secretary—I forget; but it is high.

Mr. Rood—What advantages did you find in using an excessive amount of natural gas other than those you have mentioned?

Mr. Faux—I don't find any other advantages.

Mr. Rood—Are any hydrocarbons carried off through the mains that trouble you?

Mr. Faux—No, sir, we had no such trouble. I believe, if anything, it was a benefit rather than a detriment, because the hydrogen in the natural gas absorbed the carbon that laid in the mains in the shape of oil and tar. Answering Mr. Rood's previous inquiry, I remember that while using natural gas a tremendous number of our meters gave out, which I believe was caused in a great measure by the dryness of the natural gas, which seems to be of such a composition that it has an affinity for the oils in the diaphragm of the meter. Since we have abandoned the use of natural gas our trouble in this respect has not been one-third what it was during the time of its use. Our city is divided into three sections, and it would take two men two days to get the bad meters in, but I think last month not over two imperfect ones were reported.

Mr. Rood—My experience is similar to that of Mr. Faux with reference to meters. We are using some natural gas, and although I am not well enough acquainted with its use to say what the benefits or the troubles arising from it are. I may say we are having trouble from our meters.

Mr. Faux—I saw some of these questions before I came here, and hoped that Mr. Young or Mr. McElroy would be here.

Mr. Booth—We have had an experience similar to that mentioned in respect to meters.

Mr. Smith—What was the comparative price between water gas and coal gas?

Mr. Faux—I could not say that because the Southside has used water gas more or less all the time.

Mr. Faben—I don't think the effect on the meter, as between the coal gas or water gas, would be very different, if both of the gases were equally well made. One advantage in the mixture of coal gas with water gas I have not heard stated. The flame temperature of water gas is very high and the total heat of combustion comparitively low. A very small, energetic combustion and a small flame. If the ordinary run of burners are used in consuming it, a large burner would be apt to throw off smoke. A large burner would throw off free carbon (although the flame would continue bright, and would not indicate it), and free carbon would be deposited about the room. Now, if we can add to that gas a quantity of light carbureted hydrogen, that has a low flame temperature and a large total heat of combustion, requiring the large amount of air that it does for its combustion, by increasing the size of the flame—increasing the flame area without changing its illuminating quality—in that manner we will remove the smoke difficulty. The only objection to using a large quantity of natural gas would be to give the gas too large a percentage of light carbureted hydrogen, and, requiring that large amount of air for its combustion, the flame itself would be very apt to leave the burner tip with a little air disturbance—to spread itself, without the necessary amount of oxygen in the atmosphere to bring on combustion.

Mr. Cantine—It used to be said in the revival meetings of our country that "Honest confession was good for the soul." About this time last year a little competition stared me in the face, and I struck out to get reinforcements. I contracted for a water gas plant, but the plant was a little too small to work nicely. It was a four foot cupola. It worked during the summer very nicely, but the manner in which it was connected with the old coal works made it impossible to work the two together. Having only one holder, it was a little difficult to do. When we are working one, the other would have to shut down. We met the enemy, and I don't know whether they are ours or we are theirs; but we have captured a good many of their pickets. We made a good gas—higher than the Jones photometer would indicate, but we had something that was not just as sweet a thing as water gas ought to be. It was the foulest institution the undersigned ever had anything to do with. We found it required from eight to ten hours to clean the thing. The rest of the time we made gas. We were always in that muss, and we are yet. It was no trouble at all for anybody on the street to find out what kind of business I was in; they didn't need to ask any questions. It was impossible to live in the same house with me. The odor was simply frightful. Now, we propose to get out of that scrape by making coal gas, and when the thing gets down to about the point the public will complain, we will start this thing up. I think I aged about ten years in six months. I used to grow old—to get a little old—when the holder was going down, and it was a question if it wouldn't strike ground; but this thing has hurried the matter up a little. I would like to ask Mr. Light whether we will be compelled to stay out nights with picks and shovels and bonfires to get rid of the naphthaline that will be made?

Mr. Light—That question, I think, hits the nail on the head. We don't use picks and shovels, but we keep portable boilers out. I think that is the best method to get rid of it. Every Fall-November is our worst month; for three or four nights we have to have a portable boiler out steaming out our pipes. It would seem impossible that 10 or 12 or 16 inch mains will be clogged up in that way; but they will. Nine times out of ten you will find the naphthaline just beyond the drip. Then we run in a barrel of naptha, turn on as much steam as we can get in, say 50, 60 or 80 pounds, and leave it on 15 or 20 minutes. Going to the furthest lamp post away, where the grade is down to the drip, we put in another half barrel of naphtha and pump it out at the drip, and it will take up all the naphthaline with it that the steam has dissolved. We have done this for two years. I don't know whether we will have it next year or not. I have tried everything that I can think of to stop it. We have it now in the works. I saw it the day before I left. When we first put in our water gas plant I thought: "This settles the naphthaline question." That was the hobby at first; no naphthaline where there was a water gas plant. We ran four or five months and choked up the inlets and outlets of the holder. We had it in the works the most part of that season, but that season it did not show in the street. Next season it left the works (we have not had it in the works since to any great extent), but it appears now on the street every year. Why it changed is something I can't say. It seems almost impossible to control it. As to using picks and shovels, we used to dig down and cut our mains, but found the portable boiler to answer the purpose better. Of course it must be done at night. We can't do it in day time on account of teams and things of that kind. By the way, we have one particular place—talk about going to bed and going to sleep! We have a great many hydraulics. At one particular place where we cross the hydraulic, I suppose, it runs eighty feet under the water. I remember the first time we had it, last Fall, it stopped the main solid. We cleaned it out, and the following night it was stopped up again. The way we cut it out was by putting in between five and six barrels of naphtha. We had a good deal of naphtha on hand, and simply filled that pipe under the hydraulic and pumped it out again. I think that stopped four or five times. Sometimes not two days would intervene before it would stop up. It kept stopping up that way, until we finally cut it off and ran it across the top of the bridge, when we didn't have any trouble afterwards. But that shows the way it deposits. Inside of 24 or 36 hours it will stop up a 6 inch pipe. If anybody knows any way to get rid of it, I would like to know it.

Mr. Faux—Up to this Winter I was in the same condition as Mr. Light. Until last July I used benzine of 65° gravity, and sometimes I would have two men out all the time cleaning out lamp-posts and consumers' services. One day it would be in one part of the town and the next day in another part. About the time people would want to light up in the evening the telephone would begin to ring. I didn't know what in the world to do. It was naphthaline all the time, station meter, inlet and outlet of holder, etc. I remember one time there was a stoppage in the inlet of the holder, when we had to put a big piece of iron on the end of a rope, and let it down to break that stuff. Last July I began to use crude oil. I put in a scrubber, which consisted of a boiler 25 feet long and 44 inches diameter. There is about twenty feet of solid filling in that boiler, and the wood is cut two inches wide. It is an inch on the bottom, and runs to a point on top, making it the shape of a V. I began filling within two feet of the bottom, turning each row at a slight angle with the one below it. After I got my boiler filled some of the gas men thought I would never get any gas through that, but I was going to try it. I put on what I call a scrubber pump, that would throw a $1\frac{1}{2}$ inch stream of water, hitched an engine to it, placed a barrel at the outlet and fed it with a small stream of fresh water about as thick as your finger, then pumped that liquor from this barrel into the top of the scrubber. Last Winter in condensing I would not allow my gas to get below 65°

if I could help it, no matter how cold the weather was. This Winter I let it go down as low as the temperature of the water would make it. I can't recall an instance where I have had a service stopped up by naphthaline this season. I have not seen a speck of naphthaline around the whole works, except in the bottom of the purifier when the material is taken out and thrown in the air. I noticed one morning that the temperature of the gas was down to 34°. It was condensed that low before it went into the holder. I can't say whether the pumping, and the condensing of that gas to that low temperature, have relieved me of naphthaline or not; but I have no signs of it anywhere.

Mr. Light—I don't think the remedy is in your scrubber; for we have the same identical thing. We pump the water over and over, and we have been doing that for the past two or three years. We aim to run at 60° temperature. Whether your relief is on account of the low temperature that you carry or not is a problem.

Mr. Faux—I am going to try to keep it at 45°, or as close as I can to that, to see whether that trouble will occur again. I want to find out what has been the cause of it. This is the first Winter that I have been free from naphthaline.

The President—I would like to inquire of Mr. Faux whether the extreme cold whether showed more or less naphthaline than warm weather?

Mr. Faux—Previous to this Winter?

The President—Yes, sir.

Mr. Faux—Well, I think during cold weather the changes of temperature would close me up. But this Winter I have experienced no trouble with these sudden changes.

Mr. Clark—I have had a little experience in the water gas business. About five years ago I took charge of the Elyria Gas Company, and my hair then was quite dark. In two years I felt a good deal as Mr. Cantine did. I threatened to resign and leave the Company. I would say to our President that I was disgusted and discouraged with the gas business, and wanted no more of it; but he encouraged me to hang on, and, as Mr. Light and Mr. Faux say, my pipes filled up, and how to free them I did not know—without taking a shovel or pick, or something of that kind. I labored day and night, and derived no especial benefit. Many visitors gave me advice, and I tried the remedies suggested, but without obtaining any lasting benefit. Finally a party came along who said he *could* make water gas. I replied, "You are the man I want; if you can get me out of this trouble I would like it." He took hold and ran his heats and everything entirely different from the party I had had, and the result was that my tar and lampblack ceased. We ran our heats about thirty minutes. We got a good cherry red on our generator, and a good straw color on our superheater, and made 5000 feet to a run, and had less lampblack and tar. It began to let up at that time. I changed men again, and the last man thought he could improve on it somewhat, so he introduced hot water and steam when we had any trouble. The result was, if we had any trouble or stoppage we applied the steam and followed with hot water, and now to-day we have but very little trouble. In fact, we look at it as such a small matter that it is no bother at all. I lose no sleep, and we are working nicely. But I would say we have never used Lima oil. We have always used 63 naphtha, and experienced the same trouble earlier with the naphtha that they do now with the Lima oil. Now I am making a 22 candle power gas with 4½ gallons of naphtha and 50 pounds of anthracite coal. I find I cannot get as high candle power with coke as I can with anthracite coal. We used the Rochester coke—what they call 72 hour coke—and when we make gas from it I find we cannot get our candle power as high as we can with anthracite coal. Our generators and super-heaters being so small that we get too heavy heats—that is we have to get too heavy heats—which practice is very destructive to our works. I really begin to like to run gas works; before I was sick of them.

Mr. Hyde—Mr. Clark, what has remedied the difficulty?

Mr. Clark—Well, I used to lay a good deal of it to Mr. Benham, the Standard Oil Company man. I thought they were not preparing their naphtha right. I thought they had changed it. But he laid it to our man not understanding properly.

Mr. Hyde—Are not the high heats responsible for naphthaline?

Mr. Clark—High heats make the lampblack.

Mr. Hyde—And the naphthaline also?

Mr Clark—Yes, sir. I think there is also something in the process by which they prepare their naphtha. I know we have no trouble now. They claim they are making their naphtha the same, and we have no trouble with it at all.

Mr. Light—I do not know of any gas apparatus that will cause more trouble than a water gas plant, unless it is run on correct principles. It is the easiest thing imaginable to choke it up suddenly. The least change will make lampblack on one side, and if the heats are too low you will make more tar than you should. My experience is that you cannot use too much water in your seal. I find that a way to get rid of that hard, pitchy, tar in the seal is by drawing the seal off completely. As soon as we put on a run we open the four-inch cock at the bottom and draw everything out. It cleans the seal out completely, so that there is nothing in there to thicken up. By running with careful heats there is no occasion at all for lampblack, and the lampblack is what causes the difficulty in a water gas plant.

Mr. Printz—I would like to ask Mr. Light if he had this same trouble with the naphthaline when he was using naphtha instead of Lima oil?

Mr. Light—We had the same trouble. We have been running the plant two years. We commenced using crude oil there the latter part of March or April last year. We never run strictly on naphtha, except when we could not get the crude oil. We generally run two-thirds crude oil and one-third naphtha, but we have had the same experience both years. There were very few occasions when we had to run on naphtha alone, except when we were delayed in getting crude oil. The reason we abandoned naphtha altogether was because the Lima naphtha contains too much sulphur. We had to put the whole force at the works into the purifying house; and so we abandoned it altogether.

A Member—Did you have any trouble with your superheater getting clogged up with lampblack?

Mr. Light—No, the super-heater will not clog. The deposit of carbon that is formed on the brick on the inside is burned out by letting the plant stand idle at night, with a small draft on the generator. We leave a draft in the bottom of our generator and it heats up the super-heater during the night. In the morning when we fire up it throws out a perfect cloud of white, greasy substance. We have been running twelve hours a day since last June with one set, and we have never taken a brick out and never been inside of it.

Mr. Cantine—I was going to tell you of a little trouble I had about the stoppage of our inlet pipe. I tried steam and naphtha and benzine and gasoline, and all the other materials that come from distillation of coal oil. The quantity of gas in the holder was very small. Night came on and yet we couldn't get a foot of gas through. Steam had no effect on it. I didn't know what to do. I was about in such a dilemma as the man, alone in his house, who had the quinsy, and who looked through the cupboards for some kind of medicine, and couldn't find anything until at last he found some kerosene oil. He took a dose of that and it cured him. I dosed it with oil and then took cold water and put it in, and I have never since had any trouble with naphthaline. I never got anything but a tarry naphthaline. It looks like jelly. I don't know how it came nor how it gets into the inlet.

A Member—I don't think we have had any confessions from Mr. Faben yet on this subject.

Mr. Faben—I have not any to make. A double water gas set of our own selection was put in our place and was operated by the employees of the Company that placed it there. They had some trouble. When the apparatus was handed over to us we took new men who knew nothing about the gas business or water gas apparatus. They had everything to learn and nothing to forget. They did just what they were told to do—very closely observed the operation of the apparatus when under the charge of the gentlemen who put it there. I noticed the trouble that our friend Cantine speaks of would always occur when we had anything but uniform heats. When the apparatus was strikingly hot in some particular spot the men would perhaps not be able to introduce oil in that run because that part of it was too hot. As they hadn't put anything in there to cool it, the next run it only went that much higher, and they would have to use some heroic treatment; and that was to put in a good big dose of oil, and then they made lamp black. But our apparatus is different from many used and spoken of. We have an arrangement of the combined Lowe and Granger. It has three cylinders. The first cylinder is the generator. That is of good size. It has the diameter of a Granger set and it has the modified length of a Lowe set. With that apparatus—that particular form of generator—we are enabled to use soft coal. With a short blast, say six minutes, we can bring that fuel to a very high incandescence, and then make water gas for nine minutes. In the second cylinder we vaporize the oil. The oil is atomized, having been heated in a steam coil before entering, so that the very light portions of the crude oil are vaporized by the steam heat, and the heavy portions atomized in escaping through the fine orifice and getting in there. It is showered in, and any portion of the oil that is too heavy for atomization or evaporation under the conditions named, lodges on this brick work. The temperature of the brick work is maintained at a low degree, so as just to evaporate it and let it pass on with the incoming gas. We don't undertake to gasify that oil in there. It is simply to vaporize it. When it comes down to the bottom of the cylinder, there we have a volume of water gas wrought up with the vapors of crude oil. Then it enters the bottom of the super-heater. In the super-heater we attempt to gasify it. It has a large damper. The length of that cylinder and the primary proportion of vaporization of the oil properly enable us to gasify that oil first in passing through that super-heater without exposing it to a very sharp heat. A very moderate heat will do it by treating the oil in that manner. We can look into the superheater during any portion of the run, and it is perfectly clear in there. The gas coming through does not cloud it up until towards the end of the run, and then, on account of the disappearance of heat, the vision is obscured. I have not had—I have been fortunate in that respect—any naphthaline trouble in or about the works, or in any street mains, or with any consumer.

Mr. Hyde—The secret of the cause of naphthaline is the high heats. I know, from experience with the manufacture of coal gas, that the original cause is the high heat, and then the rapid cooling afterwards.

Mr. Faux—In speaking of naphthaline before, I left something that I will explain now. I have what is called a Granger machine, that was built for benzine alone. That is, it takes oil in the bottom of the super-heater. With super-heated oil at 150 pounds pressure the engineer had considerable trouble. He almost blew up the whole works a number of times. The outlet of the super-

heater would clog up. I did not know what to do. He had his oil flown in the ash pan and all over everything. I was in a bad fix. I was like Mr. Cantine for a while—I felt like clearing out. I took hold of the machine, ran it myself for a week or so, and found there was something wrong. I didn't know what it was, but I made up my mind if I would change the machine it would do better. I took off the cap, deepened the fire and changed the inlet from the generator to the super-heater. Then it would go down the side blast pipe. In explaining this I suppose many of you have seen a cut of the Granger process. I came to the conclusion that if I could stop that from going down there I would have the thing about right. I let the machine cool down and got in there myself, I commenced to wall opposite the end of the super-heater blast pipe, and placed the brick in such a position that the oil could not get back into the pipe, compelling it to meet the hydrogen gas coming from the generator in the bottom of the super-heater. It worked perhaps for two weeks all right, and then it would back behind this wall. I studied the matter over. I had been looking up the new process—this new Granger machine that Mr. Faben has in operation—and I made up my mind I could get the results with this machine. I put a tuyere right under the second arch and sprayed my oil in there. I made a loose checker-work between the two arches where the oil has a chance to drop down and evaporate below. I now have no trouble. It is as clean as it ever was with benzine. There is no tar, and there is no trouble with the outlet or anything else. I run with very high heats in my super-heater, and there is no sign of naphthaline.

Mr. McDonald—Mr. President, I am not a gas man, as you know, but I have listened to this discussion. I think probably most of you agree with Mr. Hyde, that high heats have something to do with this; but from what I have heard of the discussions of water gas, I am of the opinion that the bringing of the oil to a high heat suddenly is the cause of the trouble. If the oil is brought to a high heat slowly, I think the trouble will be much less. I know it is generally conceded that it is much better to bring the oil up gradually, vaporizing it first and then introducing into the apparatus afterwards.

On motion, a vote of thanks was passed to Mr. Light.

An Invitation.

Mr. Faben, on behalf of the Toledo Gas Light and Coke Company, then invited the Association to a dinner, to be served in the Boody House on the following evening, which invitation was, on motion, accepted with thanks. The meeting thereupon adjourned.

Second Day—March 20—Morning Session.

The President announced that a neat souvenir badge had been presented to each member of the Association by the Central Chandelier Company of Toledo, accompanying their invitation to visit their show rooms and factory. The meeting took appropriate action expressing its appreciation of the memento and the invitation.

A letter was also read from Mr. Scott, President of the Board of Trustees of the Manual Training School, inviting the members of the Association to visit the school during their stay in Toledo. On motion, a vote of thanks was given Mr. Scott for his invitation.

A resolution introduced by Fred. R. Persons, endorsing the action of the National House of Representatives in selecting Chicago as the site of the World's Fair, was, on motion, adopted.

Mr. G. A. Hyde, sen., of Cleveland, then read his paper on

OUR NEW COAL GAS WORKS.

Mr. President and Gentlemen of the Ohio Gas Association—I esteem it an honor to be chosen a member of this Association and complimented in being requested by your Secretary to prepare a paper entitled "Our New Coal Gas Works."

The portion of the city of Cleveland lying on the east side of the Cuyahoga river is supplied with illuminating gas by the Cleveland Gas Light and Coke Company, and the west side by the People's Gas Light and Coke Company.

This paper relates to the former Company only. The old, or No. 1 Station is located at the extreme northwest corner of the territory supplied, and has proven to be a desirable location from which to suitably meet the requirements of that portion of the city.

Looking to the future, the question of duplicate feed pipes to, or the erection of supplementary works in the outlying district had to be considered, and, after due deliberation, a conclusion was reached that it would be best to erect supplementary works.

In furtherance of that plan a plot of land was purchased near the shore of the lake, at a point three miles eastward of the old works.

The plot contains about eight acres of ground, and is located between the main track of the Lake Shore and Michigan Southern Railroad and the Madison avenue branch of the Cleveland and Pittsburgh Railroad, thus affording excellent facilities for the receiving of material used in the construction or repair of the works, the receiving of coal and shipment of residuals. A brook runs through the grounds, which furnishes an abundance of water suitable for quenching coke and for the benches. Water for boilers and washers is obtained from the city water system.

As a basis for planning for the construction of the new plant, it was considered advisable to provide for the manufacture of 600,000 cubic feet of gas per day to meet present requirements; but, deeming it prudent to be mindful of the future, the houses and machinery were placed and distributed in manner to conform to a general plan contemplating a works having a capacity of 5,000,000 cubic feet.

The retort house, benches and coal shed were built for a capacity of 600,000 cubic feet, but they are placed so that they can be extended to the ultimate full capacity.

The boiler, exhauster, condenser and washer houses are joined together in the order named. The boiler house is of a size sufficient for all future requirements, and incloses two boilers for immediate needs. The exhauster house is ample for all future demands, and contains two exhausters for alternate work, each having a capacity of 2,500,000 cubic feet. The condenser house has a capacity to contain apparatus capable of properly condensing 3,000,000 cubic feet, and is so arranged that additions can be easily made to provide for the further amount of 2,000,000 cubic feet. The apparatus now set will properly condense 900,000 cubic feet. The washer house now contains one set of tar and ammonia washers of about 1,200,000 cubic feet capacity, and has space for another set. Provision was made for extending this house to receive two more sets of washers.

The purifying house, with its one set of purifiers, 25 feet by 25 feet, and the revivifying house attached, can properly pass 1,250,000 cubic feet of gas, and the building and inlet and outlet pipes are so placed that they can easily be extended to the capacity of 5,000,000 cubic feet.

The station meter house contains one station meter, 12 feet by 12 feet, having a daily capacity of 1,700,000 cubic feet, and ample room remains in the building for placing two more of same size.

The first gasholder, having a capacity of 600,000 cubic feet, has two sections of 110 and 111½ feet diameter, respectively, each section 32 feet high, contained in a tank of 114 feet diameter and 32¾ feet depth, inclosed in a brick house surmounted with a non-trussed wood roof, covered with slate. Adjoining this building is the governor and valve house, being centrally located for connections with the present and all contemplated gas holders. The piping and valves are so arranged as to admit of inlet and outlet of each holder being controlled in this building.

Two tar and ammonia tanks are located convenient to the retort house and condenser and washer houses, each having a diameter of 40 feet and a depth of 35 feet. The pump house is adjacent to the last named tanks.

The retort house was constructed especially for the convenient use of regenerative benches. The floor consists of I beams covered with ribbed steel plates. Tracks and turntables are laid contemplating the use of steam charging and discharging machines, and the house is arranged for erecting overhead coal tracks and storage bins for supplying the charging machines.

A system of water piping for fire protection, connected with the city system, is distributed through the entire plant.

The main gas pipe running through the works is thirty inches in diameter, is exposed to view, and placed ten or more feet above the ground, or floors, from the retort house to the outlet of the station meter house, excepting for a short distance between the purifying house and the station meter house, where it is placed under the surface of the ground.

I wish to call attention to this feature of our work, as it differs from the usual custom. These pipes are easily reached in case of leaks, require no basements, and permit of free access to all the machinery.

The buildings are placed in the following order, viz.:

The coal house adjoins the Lake Shore and Michigan Southern Railroad, is 100 feet wide, has a branch elevated railroad track running lengthwise along its centre, allowing the "storage" coal on one side, and the "present use" coal on the other, and nearest the retort house.

A space of twenty feet intervenes between the coal and retort houses, thirty-seven feet between the retort house and the boiler, exhauster, condenser and washer houses, and thirty feet between the last named and the purifying house, and attached to revivifying house. This last named house lies alongside of the track of the Madison avenue branch of the Cleveland and Pittsburgh Railroad.

The benches are of the Kloenne-Bredel Regenerative pattern, and were erected by Mr. Fred Bredel, of New York city.

The exhausters were manufactured and placed by the P. H. & F. M. Roots Company, of Connersville, Ind.

The condensers are of the open-air plan, but divided into rows every two feet, each row containing twenty-four six-inch pipes, of twenty-four feet in height each, and having a daily capacity per row of about 150,000 cubic feet. This method was first introduced in our present old works in 1872, and proves satisfactory. It has the advantage of making it possible to give, at all times, the same condensing treatment to the gas, whether much or little is being manufactured, but which can not be done by a single line condenser, whether open-air or multitubular water condenser. By having valve at each end of each row, there is obtained the further advantage of being able to shut off by single rows for cleaning.

The tar and carbonic acid extractors and ammonia washers were furnished and set up by Mr. Fred Bredel, of New York city. R. D. Wood & Co. furnished and placed the set of four purifiers and dry centre valve. The Maryland Meter Company, of Baltimore, Md., furnished the station meter. The Stacey Manufacturing Company,

of Cincinnati, O., furnished the holder, and Helme & McIlhenny, of Philadelphia, a twenty-four inch Foulis governor for regulating the delivery of gas to the street mains.

Gas making at the new station was commenced December 1, 1889, and has been in successful operation since that date.

The paramount endeavors in the planning and construction of this plant have been to avoid display and useless expenditures for outward effect and complication, and have been concentrated in producing the simplest and most effective methods for manufacing gas of a uniform good quality at the lowest cost.

In these days, and days to come, in which competition is to be met, the best machinery is the cheapest and most profitable. In the matter of apparatus and methods of operation, while others may be as good, we may be pardoned, I think, in believing that our new Coal Gas Works is of the best, and is well provided to *produce* the most effective gas fuel, as well as the most practical medium of artificial light.

Discussion.

The President—Gentlemen, you have listened to this paper by Mr. Hyde, and I don't think any comment from the chair is necessary. I think the end has been reached in that works; and I trust a free discussion will be had on the paper.

Mr. Printz—The description given by Mr. Hyde of his works is very vivid, so much so that we could almost carry the the works in our eye, and we can tell about what the works would look like. What I would like to ask of Mr. Hyde is the results which have been obtained in the new works—whether they have been superior to those in the old works, in the amount of gas produced per ton of coal, and also as to the saving in the amount of coke used—that is, the percentage of coke that has been used to carbonize say 100 pounds of coal; whether the difference has been very marked between that formerly used in the old works and that used in the new works.

Mr. Hyde—As the acceptance of the Bredel benches depended upon their results, a test was made to ascertain the percentage of coke used. Four benches were run a week, according to the contract, on 19 per cent. of the coke produced. That was the trial. We have been running three months. Of course it is in the beginning of the work, and under the management of those who have not been accustomed to use this kind of bench, and with those benches (as any benches, or any new work in new hands) it is necessary to run for a while to get accustomed to the methods. The other day, my son, who has charge of the works, reported that, as near as he could make out, they ran a week with 22 per cent. Of course they didn't include in the first test an occasional stopped stand-pipe, and that interferes with the record which might be obtained where you are making a trial, the first trial especially. We feel satisfied that somewhere about that amount of coke will be required to heat the benches, 22 per cent. In the old works I have run with our plan of old benches for a month with 25 per cent., and I have run six benches for six months or a year with 27 or 28 per cent. It would seem from the information which I am able at present to present, that there is a saving of probably 5 or 6 per cent. in the use of the Kloenne-Bredel benches. What the future will develop will be the experience of the manager, and we do not know now. It may be less than that, but I apprehend that 22 per cent. is about what we may expect. Does that answer your question?

Mr. Printz—Yes, sir. Another question that I would like to ask—were not the old benches you speak of extraordinarily good benches, or good settings, for the old style? That 22 per cent. you speak of is much below what we usually hear from the old settings.

Mr. Hyde—As far as I was able to determine that, and I made many inquiries in years past, with reference to the consumption of coke, our experience compared with that of every other gas works that I inquired of, was such that I can scarcely believe my own statement, because everybody else said otherwise? I could not understand why we were able to keep our furnaces at the right heat with so small amount, when every other company varied from 40 to 50, even 60 to 70 per cent. of the coke produced. I couldn't understand how we were able to run six months with 27 or 28 per cent. under, you might say, unfavorable circumstances—like charging benches and having them ready for use, and holding them for dark days, etc. But we seldom got above 30 or 31 per cent. It always had been for a long time, rather a mystery as how it came—whether the others were careless in their statement or what it was. I knew I was making the statement, and I knew the information I obtained was correct. Mr. McIlhenny was at our works a year ago, where we were constructing a bench, and he said: "I see the philosophy of your benches now. I never could understand it. Your furnaces are short and narrow and others are long and wide." That was partly in confirmation of what I had ascertained myself at one time. About 15 years ago we got a plan from New York for the erection of a set of benches that called for a length of $4\frac{1}{2}$ feet furnace, I think, and 14 inches in width. That was the grate-bar surface. Mr. Christy, our superintendent of the works, and myself noticed they were much at variance with ours, and we said, "Now, ours are all right, and what is the use of having anything better?" But we concluded to set up three benches on the new plan, and built the other nine on the old plan. Then we set to work to see if there was any diffierence in the practical use of them. We tried them on coal and on coke. We ran long enough to demonstrate the practical use of them on each kind of fuel, and the result was that with the new style we used about 2,000 pounds of fuel per day; while with the $3\frac{1}{2}$ (I think it is something like that), and 12 inches wide, we used about 1,600 pounds. That would be three-quarters of the quantity, and we produce the very same heat exactly. We could not use less than 2,000 pounds with the wide furnace, and we couldn't use more than 1,600 with the other, but the heats were the same, and the quantity of coal carbonized in the retorts was the same. We also tried the coke, but I cannot give the quantity. The results, however, were the same, or about in that proportion. So we demonstrated, to a certainty, and gave an explanation why we were using less fuel than others. But I can't now see how any company could use up to 50 and 60 per cent. when we were using 28 or 30. While in Massachusetts I called at several places and asked of them the quantities, and also told them our experience. They looked at me as though "that would do for a western man to tell a down-easter; but we don't take any stock in it." I was astonished to find they used so much. What did they do with it? that is the question. Mine, you would say, was absolute measurement. We filled so many retorts with coal and pulled so many out. It is not measured, but the retorts are charged alike, and a certain proportion of them used, so there is no mistake about the quantity. I think I have answered the question.

The President—You got the same yield from the short and narrow benches?

Mr. Hyde—Just the same with the same charges.

Mr. Smith—Any difference in the depth of the furnaces?

Mr. Hyde—No, sir; constructed the same and fed the same; treated the same every way.

Mr. Printz—I don't wish to monopolize the time of the meeting by asking all the questions, but I would like to ask another, and that is—the size of the retorts in the benches, the amount of coal you were charging into them, and the yield you were getting from these new benches?

Mr. Hyde—Now?

Mr. Printz—Yes, sir.

Mr. Hyde—It was understood that we were to get 9,000 cubic feet to a retort. We have averaged from nine to ten thousand.

Mr. Printz—Now, the size of the retort?

Mr. Hyde—The retorts are 15 by 26, by 9 feet 4 inches.

Mr. Printz—Charged every four hours?

Mr. Hyde—Yes.

Mr. Printz—What weight?

Mr. Hyde—333 lbs. we are charging now. I think that is the highest—333, 316, sometimes 300, depending on the condition or necessity.

The Secretary—Mr. Hyde, what disposition do you expect to make of your old works? What will be their ultimate fate?

Mr. Hyde—There can be no change made in the old works, except to use them as they are.

The Secretary—Indefinitely?

Mr. Hyde—Indefinitely. That is, we do not see now any reason why we should lift the benches up and have a basin where the benches are. It is not convenient. The width is not right, and the probability is that we shall use them as they are. They are not extravagant in the use of fuel. We have not thought of it, but I don't suppose there will be any change.

Mr. Printz—One further question I would like to ask, and that is as to the care in the handling of these new benches. Is it necessary to draw the clinkers from the furnaces as often as you do in the old set?

Mr. Hyde—I wish I could tell you something about the running. I have been busy about other things. My son runs the works. I am satisfied of this, that there is economy, of course, in being able to draw your coke out of your retorts to run it down into the basement instead of hauling it off in some other way. The tendency is to economize; to what extent I am not able to say, I wish I could state that, but they are new to us and I have been busy about other things and have not paid attention to it so as to be able to answer.

The Secretary—After you make increases to a considerable extent, do you anticipate any trouble from back pressure thrown by these Bredel tar and carbonic acid extractors and ammonia washers?

Mr. Hyde—No, sir, we don't anticipate any difficulty in that respect. We calculate to run about eleven hundred thousand and when we get to that we will have another set.

The Secretary—What pressure do they throw now, with your make at 600,000 feet?

Mr. Hyde—It is eleven inches.

The Secretary—That is the aggregate pressure before the exhaustor?

Mr. Hyde—Yes, sir.

The Secretary—What pressure, for instance, does the ammonia washer itself throw?

Mr. Hyde—I could not tell you that. I only noticed the other day that it was eleven inches before the condenser.

Mr. Cantine—Why, if water gas plants are so good and generally used and so popular, why did Mr. Hyde not put that in a plant of that type instead of this 5,000,000 coal gas plant?

Mr. Hyde—We think a good deal of water gas, but we don't use it. As far as we have been able to ascertain we thought it safe to use the process that we were familiar with. We know we make gas at not a high price, that is we make it cheap, and the method and process we are familiar with and we make it with ease, and everything has been satisfactory so far. The question of introducing a water gas plant has occasionally been brought to our at-

tention and we think some time we will put in a set. However, if we don't put it in any faster than we talk, it will be some time; for we have talked about it for ten years. We bought the right to use the process about ten or twelve years ago. I am satisfied of this, that it would be well to have a plant, because in Cleveland, as in other places, we occasionally have a dark day, and when it is dark, it is dark. We have repeatedly, or about once a year anyhow, consumed all the gas we make between sunrise and sunset as fast as we made it, and our supply for the night is what we had on hand at sunrise. So, if that day should be repeated we would be floored. In an emergency of that kind I think it would be desirable to have a water gas apparatus so that when we found the day was going to be dark we might commence making water gas to replenish. But from all we have been able to find out or learn, we have not decided to change yet, any way. We have got coal gas yet.

Mr. Evans—I would like to ask Mr. Hyde to state how much his gas costs him in the holder?

Mr. Hyde—That is a question that I could not answer before any public assembly.

The Secretary—I would like to ask Mr. Bredel, who is now present, the question I asked Mr. Hyde, as to what pressure his ammonia washers throw with that 600,000 feet daily make?

Mr. Bredel—All the way from three to five inches pressure.

The Secretary—Isn't that a good deal?

Mr. Bredel—No, the exhauster will take care of it all. You will have to push your gas so much harder. I don't see any objection to high pressure. I know of gas works where the pressure is up as high as 14 or 15 inches, and I don't see the objection to it.

The Secretary—As I understand it, your purifying boxes don't throw any pressure at all.

Mr. Bredel—No.

The Secretary—But after the make increases materially I should think these purifiers would throw the usual pressure, which is considerable, and then your aggregate pressure, it seems to me, would be rather high.

Mr. Bredel—Well, it might be that the purifiers afterwards will throw about an inch pressure. If they throw more there is something wrong. Your purifier is not large enough, or your purifying material is not good.

Mr. Printz—I would like to ask Mr. Hyde if that saving of five per cent. in the coke is sufficient to justify the extra expense incident to the cost of this Kloenne-Bredel furnace over the old settings?

Mr. Hyde—Well, I have not taken that into consideration. In investigating this matter of putting in the new works we concluded that we would have in a set of these benches for trial, but I have not investigated. After we get fairly going and have run several months, we shall settle all that conclusively. I, however, may say this, we expect to extend our retort house and put in the same kind. We expect this year to extend the retort house 500 feet, and expect to build a tank of 145 feet in diameter for the same works. We are contemplating the need of further extension.

Mr. Printz—I would suppose that there is not only this saving of five per cent. in the fuel, but the advantage which you obtain by the setting, in the handling of your coal and getting rid of your coke, would certainly be quite an inducement to make a change of this kind.

Mr. Hyde—Yes, sir, we expect that; but you asked a definite question, and I can't answer it. I would be pleased to if I could. Of course we expect to get benefit from the use of this or else we would not think of extending it.

The Secretary—With us the price of coke is so low that the study of the economies in coke saving is not a matter of any particular importance. Our coke nets us only $3\frac{1}{2}$ cents, and although our regenerator furnaces consume more coke than they ought, we don't care very much. We use at least 30 per cent. of the coke we make in the furnaces.

Mr. Printz—One of our bashful members requests me to ask the price which Mr. Hyde gets for his coke.

Mr. Hyde—The ordinary price is seven cents for the coarse coke. For our crushed coke we get $8\frac{1}{2}$ cents at the works.

Mr. Faux—Do you not expect your retorts to last much longer than under the old system of firing?

Mr. McIlhenny—I believe the usual way of measuring the life of a retort is by the quantity it produced during its life. If a retort is run hard and produces in a year five million feet, and another runs three years and only produces the same quantity, the one that runs a year has done as much work as the other one. It is a question of production rather than a question of time.

The President—That is undoubtedly true, but the factor comes in there, however, whether the one system maintains a more uniform heat than the other. I think we will all agree that that system that maintains the most uniform heat, even if it be somewhat higher heat, would perhaps be not more destructive to the retort than a lower and vacillating heat.

Mr. McIlhenny—Yes, of course. The regenerator system is like running a train without stops at stations. You don't have to stop and start the train again. You draw the hot coke into the furnace, and there is no cooling of the retorts by the cold coke being thrust in. Now you have a practical advantage in that direction, I think. You have a more uniform heat, of course, upon the bench, and better results. Besides, we all know that all kinds of material contract and expand more or less by heat and cold, and when you cool your bench down by throwing in cold coke there is more or less contraction of the retort, and it takes some fuel to bring that heat up again to the condition the regenerator should maintain.

Mr. Faux—The reason why I brought out that question was this: I use natural gas. Three years ago when I took charge of the works, there were benches that had been dismantled and torn out. The retorts were good but they wouldn't heat with coal and coke any more. I refitted them, put natural gas under them and have run them now three years, and I find they are in very good condition. The reason I brought that out is to show that with the regenerator furnace and firing by gas, the life of a retort is much longer than by firing the old way. I believe in gas firing under a retort.

Mr. Bredel—Mr. President, I think the injury is due more to the solid pieces of coal that get in the ordinary furnace and, coming in contact with the retort, form a flux there and make the retort crack. Now in the regenator furnace no flying ashes or anything can get into the retort and form a flux, and, as Mr. Faux says, naturally, this is an advantage in firing with gas. Another thing, if you open your filling door, there is not much chance for cold air to get in. Of course if any cold air gets in it will have to pass through the generator and will be warm by the time it strikes the retort and will not crack it.

The Secretary—Mr. Bredel, what is the proper temperature in your regenator furnace when it is working right?

Mr. Bredel—That is a pretty hard question to answer. The proper temperature of the furnace itself, of the fuel, should not be much hotter than the coke coming out of the retort. In attempting to estimate this I use an apparatus of my own contrivance for that. You cannot call it a pyrometer, but I have used it quite satisfactorily. It is a very simple arrangement, but it is only for comparative heats. I take a small box and make little slots in it and take blue glass and cut them up into pieces of one inch square and put 20 to 30 in it. Then bore a little hole on both sides, about half an inch in diameter, look at the fire, and put so many blue glasses on until I can't see anything more. Then I rate by how many glasses it takes. In this way I have a comparative test.

The President—In the matter of economy in firing, the regenerative furnace has one advantage that I have not heard brought out yet, and it strikes me that it is much greater than many of us are perhaps apt to give it credit for, namely, the fact that the fuel is dropped in at the top. Of course there would be no current of air in that case, as with a door opening squarely in front. In the latter case you get a current of air through the ordinary furnace, that means a good deal of disaster. Of course every time the door is opened for stoking or charging or anything of that sort a current of cold air rushes in. I have no doubt the difference is very much greater in that regard than many of us think.

Mr. Hyde—I would like to make mention of a scheme that I have in mind. Whether it will ever be carried out or not at our works I don't know. In perfecting our method of handling coal and coke at our new works my scheme is to shovel the coal into a car from the coal shed, where, of course, it is unloaded; lift the car and dump it into a crusher for crushing it for the steam charger. It would pass through the crusher into another car. That car would be lifted high up into the retort house, and run around on the tracks on each side of the house to the dumping bins. Out of these bins the coal would be drawn into the steam chargers and be blown into the retorts. Then, after carbonization, withdrawn by steam with the steam stoker, and drawn into the chutes in front of the retorts down into the coke car—that car to run along on a track to an elevator, and be lifted and dumped into a bin; the coke drawn out of that bin over a screen that takes out the dust, and continuing a little further, takes out the pea, if you choose, then the nut and the dust and the pea are deposited in seperate bins, and the coarse coke will run into a car. One shoveling in the works, after the coal is unloaded into the works, does the whole business. We have no track at present for delivering the coal into these bins, and have no bins as yet. But that is what we are thinking of doing, and if we do, one shoveling will do the whole work.

Mr. Dittmar—Mr. President, since we are on the different modes of manufacturing gas, and manufacturing it quickly, I want to ask Mr. Hyde whether he fully looked into the matter of the various processes of manufacturing before spending the amount of money he did for manufacturing coal gas?

Mr. Hyde—Only in a general way. Of course almost any one is familiar with the method of making gas by the water gas process. But we didn't go into that particularly. We had in view having a coal gas works, and we did not investigate perhaps thoroughly with reference to all the other methods.

Mr. Dittmar—As I understand you, you anticipate putting in a plant for making gas quickly. Did I understand you rightly?

Mr. Hyde—No; we expect to extend our present method.

The President—I think Mr. Dittmar partially heard what Mr. Hyde said with reference to water gas processes. Mr. Hyde did say they had had under consideration the matter of water gas, but that if they made progress as fast in the adoption of water gas in the future as in the past, it would likely be a good many years before it was put into operation—or something of that kind.

Mr. Dittmar—I judge, then, from that remark that Mr. Hyde is not very much impressed with these different processes of water gas manufacture.

Mr. Hyde—Well, I cannot say. You might draw that inference. We have not yet concluded to put in a water gas plant.

On motion, a vote of thanks was extended to Mr. Hyde.

(To be Continued.)

[Communicated Article.]

Doubts Versus Dogmatism.

By Mr. B. E. Chollar.

At the meeting of the Western Gas Association. held in St. Louis, in 1887, the writer read a paper on "The Rule of Inverse Squares," in which he endeavored to show, by a simple geometrical demonstration, that the commonly accepted law of light, as applied in the practice of photometry, exaggerates the value of a small light to the consequent disparagement of a larger one.

The paper, although prepared with some care, was intended by no means as an elaborate effort, but, on the contrary, was offered as an invitation to our scientific friends to take up the discussion of the subject with a view of clearing away the very serious doubts in the minds of many in regard to the truthfulness of the photometer.

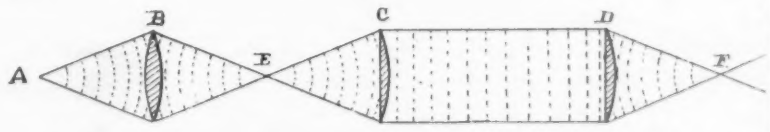
It is unnecessary to say that the paper failed of its object. The criticisms were few in number and extemporaneous in nature. The general inference seemed to be, however, that the writer might possibly engage in a more suitable occupation than in that of questioning natural laws as they are laid down in the books.

The paper was disposed of in short order; but the doubts still survive. And the doubters persist in believing that a big light has some sort of an unrecognized value not possessed by a little one.

Where there is much smoke there must be some fire. Let us look again for the fire.

We will suppose a luminous point, trace an imaginary beam of light from it through a series of ideal lenses and note the result.

Although in reality it is altogether probable that there can be no such thing as a "ray" of light; yet the conception is correct, and the expression is so intelligible and convenient that we will make use of the term.



In the diagram let *A* represent the luminous point, situated in one of the conjugate foci of the lens *B*. The effect of the lens upon the light received by it will be to change the direction of the rays and converge them at *E*, which point we will make the principal focus of the lens *C*. At *E* the rays will cross without change of direction and diverge to *C*, where they will again be changed in direction and made parallel, in which relation they will continue until, by the lens *D*, they will be directed to the point *F*. The general form of the wave point of the diverging rays, from *A* to *B* and from *E* to *C*, will be convex in the direction of the light, while that of the converging rays *B* to *E*, and from *D* to *F*, will be concave. From *C* to *D*, the light rays being parallel, the successive wave points will be parallel planes. If, therefore, the light from the luminous point *A*, advancing with a convex wave point, decreases in strength in proportion to the square of the distance, it follows, conversely, that light from the surface *B*, toward a point or with a concave wave point, must increase in strength at the same rate.

Similarly, light made up wholly of parallel rays should neither increase nor decrease in strength.

Here we have severally—if the expression may be permitted—three distinct kinds of light; one of which decreases, another increases, while the third remains constant in strength as the distance increases. A luminous point can emit only the first, while a luminous surface sends out all of the three kinds of light, only one of which diminishes in proportion to the square of the distance.

The other two kinds alone possess the characteristics of what we call diffused light. Diffusiveness in light, therefore, is a quality produced by converging and parallel rays; hence if these rays are not governed by the law of inverse squares, diffused light is not; and it follows, in comparing a large light with a small one, that the photometer is a prevaricator.

The mendacity of the photometer lies in the scale graduated on the bar, and the law under consideration can be proved true by the photometer itself no more than a tape line can be proved correct by measuring backward over a distance already measured by the same tape.

It is well to be precise; but it is better to be correct. And it is hardly worth our while to spend time in looking for a light-standard of third decimal place precision, so long as the photometric bar may possibly be wrong in units.

In the meanwhile it appears to the doubters that the larger light is entitled to a credit over the smaller by reason of its size, and independent of its brightness. In other words, that photometer experiments, as they are ordinarily made, should be corrected by an addition to the observed value of the larger light.

The Influence of an Idea.

The London *Journal*, in its issue for March 18, says that a curious illustration of the influence of a fermenting idea is to be observed in the progress of the improvement of gasholder design by the suppression or radical modification of the guide framing. It is some time since we devoted any space in the *Journal* to a review of this modern improvement, and meanwhile the change that was a few years ago regarded by most engineers as chimerical, has become a commonplace of engineering, as our advertisement pages testify. It will doubtless require time for all gasholder makers to fall in with the new movement, especially as the two best known arrangements for dispensing with the outer guide framing of gasholders are proprietary. Contractors who do not possess workable patents of this class will naturally disparage their value, in order to keep work in their own hands; but the commercial future of this reform in the principles of gasholder construction will settle itself. We have nothing to do with this part of the question, but desire for the present merely to call attention to the remarkable practical effect that a single idea has wrought in this branch of engineering; and we do this not for the sake of unduly magnifying the value of this particular idea, which may be great or small, but in order that any reader who may at any time start a similar idea may be encouraged. In most professions, and particularly in gas engineering, there exists a robust class of critics who claim to be nothing if not "practical." They weigh everything in the same balance, and pass ideas over their weighbridge just like trucks of coal. Anything by way of suggestion that cannot be weighed in this fashion, and its value determined forthwith in current coin, they dismiss as "theoretical"—which in their mouths is a term of contempt. These critics are eminently respectable and useful in their way; but it is well to occasionally remind them and the world that they do not know everything. There are matters which cannot be weighed on a weighbridge, or measured by a two-foot rule, but which may in the fulness of time set many weighbridges and rules to work. These are fundamental ideas. Nobody can tell for certain, when a strange suggestion arises in his own thought, or is communicated by his neighbors, whether it is likely to bear fruit or not. Technical journals and the records of the Patent Office bear witness of many suggestions that never come to anything. There is no recognizable hall mark on these productions of the mind. Not even their parentage serves to indicate their value; for the most striking thing about the life work of every eminent man is the amount of suggestion which he produces to waste. A Siemens or a Bessemer, whose ideas sometimes create new industries, make more failures than successful shots; so that not even the best accredited ideas can be accepted without practical test. On the other hand, the most obscure thinker may discover a clue to an industrial advance that has escaped others. It is his duty, therefore, to give his ideas a fair chance of being heard; and fortunately the means of publication are so generally available now-a-days, that nobody need despair of a hearing for aught he may have to say that is not obviously ridiculous.

The distinction between a fertilizing idea and its practical application is radical. The idea may be expressed in a few words; but the application may take years in working out. The property in the original suggestion and in its utilization may, and generally does belong to different people. Sometimes, but happily not always, the first discoverer essays to protect himself from the improver by patenting every imaginable modification of the embodiment of his idea; and when he has overlooked a weak spot that is taken advantage of by another, he is loud in his denunciations of the infringement. It is probable that more general good is effected when the discoverer keeps himself independent of the practical deviser of applications, whose genius is of a totally different character. We say this because it is possible that here and there may be found men who have in their minds more or less clearly defined ideas on various industrial problems, which they are not disposed to publish for what they are worth because they have a half-wish to keep them until they can clothe them in working shape. This day never comes. The man with the idea never succeeds in devising the practicable embodiment for which he waits; and so his idea perishes with him. It is not always that he keeps his idea to himself with a view to his personal gain. Such conduct would be undoubtedly selfish and short sighted, but not necessarily iniquitous. It may well be, however, that the man with the idea does not keep silence through selfishness, but simply through modesty. He has the idea, such as it is, but cannot himself see

what practical good it represents, and has no hope of acting upon it. He is afraid of the robust practical critics already referred to, who are sure to "sit upon" him for venturing to dabble in a "theory" which has no apparent connection with their experience; and so he keeps his own counsel, and the world is the poorer of a suggestion that somebody else might have been able to work up into a useful shape.

It will not perhaps be an undue exaggeration of the worth of the example if we cite the history of the movement for the suppression of gasholder guide framing of the usual description, in support of the foregoing observationns. About this time three years ago there appeared in the *Journal* an article entitled, "Is Lofty Guide Framing Necessary for Large Gasholders?" which began with the statement that "the question as to what is the precise value of gasholder framing is one that has been raised several times by engineers with a propensity for diving after abstract principles of construction, but has not yet been settled, or even placed upon the road that may lead to settlement." The gist of the article lay in a suggestion that a gasholder might be maintained in a proper working position by means of the bottom curb. It was the first promulgation of the idea of guiding gasholders from the base. And now let us pause to point out that this was no more than an idea, stated simply for what it was worth, without any attempt to apply the principle. The time was apparently favorable for the suggestion, although there had not been any prior discussion of the subject. Within the week, Mr. V. Wyatt came forward to admit the force of the suggestion, and wrote the truly remarkable words for the time: "I quite anticipate the production of a self-sustainmg gasholder in the future." The fulfillment of this prophecy at Northwich and Haslingden by two different methods of gasholder guiding not then thought of, is one of the most interesting developments of modern gas engineering. It is unnecessary to do more than mention the work of Mr. George Livesey in this connection; but his remarks on the original suggestion are instructive, in view of accomplished facts. He said: "If some practicable means could be devised whereby all the bottom rollers might be made to rise or fall equally, and none of them could either rise above or fall below the others, the holder would then, to all intents and purposes, have a solid foundation, and no columns or guide framing of any kind would be necessary." Mr. Harry E. Jones and Mr. F. D. Marshall must also be included among the few who realized the speculative value of the idea expounded in the *Journal* article; while nobody could say that he was satisfied with the only suggestion then offered for embodying the principle. Time passed; Mr. W. H. Y. Webber's paper was read and discussed at the Glasgow meeting (1887) of the Gas Institute; and still the idea remained "in the clouds," although an increasing number of engineers came to think there was "something in it." Months afterwards, the idea showed signs of bearing fruit. Mr. W. Gadd was first in the field with a printed device for maintaining the verticality of holders without lofty guide framing; Mr. Pease perfected a different means of attaining the same end; and the list of inventors who sought to solve the practical problem in various ways includes at least half a dozen other names, and might probably be largely extended. All this simmering effort, be it understood, followed the publication in these columns of a thoroughly unpractical "notion," which the original promulgator has never attempted to convert into an actual fact. In all probability the coming summer will witnesss a noteworthy expansion of the trade in gasholders without external guide framing. Which will be the favorite system to be followed in this and foreign countries, is not for us to anticipate. Whether the known devices will be supplemented or superseded by others, is another question that must be left to the future to answer. At any rate, an economy of about 30 per cent. in the cost of a holder is something that no conscientious gas manager, duly solicitous for the rightful application of his employers' capital, can affect to ignore. The revolution in gasholder design has been effected; and those engineers and contractors who are specially interested in the new departure will have plenty of work from this time forward. The men who have made the new principle workable in despite of all the opposing forces of ignorance, apathy and prejudice, deserve all the reward they will get.

In concluding this short notice of the origin and present position of the most striking reform in gas engineering practice that has been brought to pass since the existing type of gasholders was adopted, we repeat that our main object has been the encouragement of the expression of ideas by those who entertain them, irrespective of their apparent value, in a practical sense, at the time. It is not necessary to define the limits that separate from mere dreams those suggestions which have possibilities of usefulness. The line need not be drawn too closely, for the dreams of some men are worth more than the waking sense of others. Ideas relating to industrial developments are not more frequently of the nature of dreams than many of the political projects that fill the daily newspapers; and it is hard to see why an engineer as well as a politician should not be allowed his occasional flight of fancy.

Professor Wolcott Gibbs on Illuminating Gas.

Professor Wolcott Gibbs some evenings ago delivered a lecture on illuminating gas before the Business Men's Association, of Newport, R. I. There was a large attendance of members and inv'ted guests, among the latter being Professor Munroe, Major Livermore, Dr. C. A. Brackett, A. B. Almon, Colonel E. M. Neill, John Whipple, A. B. Emmons, E. P. Allan, W. E. Dennis, C. E. Hammett, Jr., J. G. Topham, Dr. H. R. Storer, Rev. Mahlon Van Horne, James S. Bryer, Rev. Warren Randolph, W. A. Barber, G. P. Taylor and Captain H. B. Ryder. Mr. L. D. Davis, First Vice-President, was in the chair. The lecturer introduced his subject by giving the following figures showing the analyses of the average coal and water gas in use in Massachusetts:

	Coal Gas.	Water Gas.
Marsh gas	38	21
Hydrogen	47	32
Carbonic oxide	6	27
Illuminants	5	15
Impurities	4	5
	100	100

And then went on to say that marsh gas is a colorless, odorless and tasteless gas; not poisonous, but capable of producing death by suffocation. Hydrogen is also a gas, tasteless, odorless and colorless; not poisonous, but producing death by suffocation. It prevents the blood from being oxidulated. Carbonic oxide is a colorless gas, nearly or quite odorless, but is deadly poisonous. The illuminants are sometimes 2, 3, or 4 in number, and are very important in the manufacture of either gas, as without them the commercial qualities of the gases would be of little consequence. The impurities are composed partly of carbon dioxide or carbonic acid. They are of no great consequence, but are necessarily present from the nature of the materials used in the making of gas. Marsh gas, hydrogen and carbonic oxides burn with a very pale light, which makes them of little value in commercial use in the composition of illuminating gases. It therefore becomes necessary to have something to afford illuminating qualities. In some of the larger manufactories of gas, oil is used to give a larger proportion of illuminating power. Passing hurriedly over the manufacture of coal gas, the speaker said that the manufacturing of water gas is one of the most beautiful processes in manufacturing chemistry, its simplicity exciting the admiration of experts. Coal or coke is heated to a high degree of temperature by means of air blasts and then a jet of steam is forced over the heated substances and decomposes into hydrogen and carbonic oxide, the gas being collected and cleaned. Pure or simple water gas is composed almost entirely of hydrogen and carbonic oxide, but this is of little value as an illuminant. The lighting qualities are imparted to it by the introduction of petroleum or naphtha. The process is simple; the plant occupies but a small space and requires little scrubbing or cleaning. It must be very cheap. But there are no side products as in the manufacture of coal gas. In the latter the coke, ammonia water and coal tar are of a considerable commercial value. The coke is used for heating purposes; from the ammonia water nearly all the ammonia used in the arts is obtained, and from the coal tar the hundred or more aniline dyes are produced. In taking into consideration the cost, the value of these side products is of much importance, yet the speaker thought that the fact that so many gas companies are using water gas shows conclusively that the manufacture of that gas would be much less expensive than that of coal gas.

Professor Gibbs devoted a large portion of the lecture to the consideration of carbonic oxide. This is usually admitted to be one of the most, if not the most, poisonous of gases. It is directly poisonous, acting upon the blood corpuscles, displacing the oxygen and taking its place, and thus paralyzing the corpuscles. He then read Sir Humphrey Davy's experiment of the effects of carbonic oxide upon himself, and those of Messrs. Nichols and Sedgwick, of Massachusetts, and of German and French chemists, which had been to determine the amount of the gas necessary to produce death. These experiments have shown that the presence of one-half of one per cent. of carbonic oxide is exceedingly dangerous, and will almost inevitably produce death. The experiments of Messrs. Sedgwick and Nichols were also directed to determine what per cent. of air will be displaced by a gas in a commonly ventilated room, where it is not absolutely air-tight. It was found that the air of such a room will contain 3½ per cent. of gas. Taking his

table mentioned in the beginning, Mr. Gibbs showed that in the case of coal gas, which contains only 6 per cent. of carbonic oxide, the 3½ per cent. of this amount (.21 of one per cent.) is far below the danger limit; while in the case of water gas, 3½ per cent. of its proportion of carbonic oxide (27 per cent.) leaves a presence of .95, or nearly one per cent. of the poisonous gas, which is far above the danger limit.

The return petition before the Legislature for a law governing the amount of carbonic oxide in illuminating gas was for the purpose of keeping the proportion of obnoxious gas below the danger limit—10 per cent. In an analysis of the gas in use in Newport a few weeks ago the proportion of carbonic oxide was found to be 9¾ per cent., which is less than the required limit; the local company using a mixture of coal and water gas, which reduces the proportion of carbonic oxide. Mr. Gibbs said that coal gas and water gas in use as illuminants are both detectable by the odor, which is produced by the illuminants and impurities. The danger of the gas is from its escaping from the fixtures, which are not always tight, from carelessness in turning off the light and leaving the gas to escape, in the dropping out of the stoppers, and from the breaking of mains in the streets. The last is the most dangerous of all, as it has been found that in the passage of the water gas through the earth the gas is purified and loses its odor, so that it may come into our cellars and its presence be undetected until it affects our health. The dangers from the leaks of the common water gas are more pronounced than from coal gas, because of the presence of a greater proportion of carbonic oxide. There is no difference in the explosiveness of the two gases—that is, one will not explode more quickly than the other; but the water gas is more violently explosive than the coal gas, from the fact that the former contains more illuminants than the latter, and this causes the greater violence of the explosion. It is claimed that coal gas exhausts air much more quickly than does water gas. The products of combustion are the same in both, and about as much oxygen is required by one as by the other, and the difference in this respect is not worth noticing. In conclusion, Mr. Gibbs said that the State fixes the danger limit in kerosene and illuminating oils, and that it could take the same action in regard to gas.

At the conclusion of Professor Gibbs lecture Mayor Coggeshall spoke briefly in defense of the Newport Gas Company, saying that it did not desire to provide a dangerous gas for its consumers. He spoke of the advantage of public discussion. He was in favor of water gas, which he believed to be the coming illuminant.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. Wm. Johnson, for many years a collector in the employ of the Fulton-Municipal Gas Company, of Brooklyn, N. Y., is dead. He was a faithful man, and much esteemed by his employers.

The following action of Mayor Barker, of Providence, R. I., in respect to the proposed chartering by the Legislature of that State of the Wakefield Manufacturing Company, goes to show that the local authority is alive to the slight which would be put upon them in the event of the passage of the measure. The documents explain themselves:

City of Providence, Executive Department,
City Hall, March 27, 1890.

Gentlemen of the Board of Aldermen: I have convened you to-day in order to present a message in relation to a proposed act of incorporation of the Wakefield Manufacturing Company now pending before the General Assembly of the State of Rhode Island.—Henry R. Barker, Mayor.

City of Providence, Executive Department,
City Hall, March 27, 1890.

Gentlemen of the City Council: An act of incorporation has recently been presented in the General Assembly by which it is proposed to give to the Wakefield Manufacturing Company authority to produce, make, generate, sell, use and supply gas in the city of Providence for lighting, heating, mechanical and other purposes, etc. Section 4 of said act provides that "said corporation upon filing its bond in said cities of Providence and Pawtucket, in the sum of $25,000, with the Treasurer of said city or cities to secure the putting of the streets of said city or cities, wherein it may choose from time to time to exercise the powers to it granted by this act, in as good order as said streets and highways were in at the places wherever said corporation may do work at the time of commencing work thereon, may open the ground in any part of said streets or highways for the purpose of laying, putting in and down and repairing pipes and other appliances for the use and the conducting of gas, and for any other purpose necessary or incidental to or convenient for the exercise of the powers granted by this act." It will be seen by the provisions contained in this section that this Company, if the act is passed, will obtain the right to use any of the streets in which it may determine to lay and use its pipes without any control thereof being had by the City Council, either as to the streets used or the manner of their use. Deeming that such broad and extensive grants should not be conferred upon any corporation proposing to do business in this city without making it subject to such proper restrictions and limitations as the City Council may impose, I have brought the matter to your attention in order that you may take such action thereon as may by you seem best. —Henry R. Barker, Mayor.

The following is extracted from the annual report of the Halifax (N. S.) Gas Light Company: The net income for the year was $24,092.52, and the total expenditure on all heads was $72,721.41. The following is a recapitulation of the balance sheet to Jan. 31, 1890:

Capital stock	$400,000.00
Amount due by Company to wear and tear and contingent account	196,426.00
Dividend, payable April 1	12,000.00
Profit and loss account	15,493.00
Total	$623,919.00
Gas works, etc., meters, materials, coals, electric light station and materials	590,754.00
Cash on hand and due Company	39,165.00
Total	$629,919.00

Profit and Loss.

Dividend, paid Sept., 1889	12,000.00
" payable April, 1890	12,000.00
Balance carried forward	15,493.26
Total	$39,493.26

From a local source we learn the following respecting the situation at St. Louis in the matter of the proposed 90 cent gas rate: "Interesting developments are expected after the 90 cent gas rate bill goes into effect, at noon of to-morrow—March 29. The bill, as probably your readers are aware, makes it a misdemeanor for any Gas Company in the city to sell gas at more than 90 cents per 1,000 cubic feet; and as the Laclede Gas Light Company, through President McMillin and Vice-President Thompson, has announced its intention to maintain the present rate ($1.25), it is probable that Mr. McMillin, as President of the Company, will be arrested on charge of violating a city ordinance; and if this is done, St. Louis will likely be the center of some interesting lawsuits. When Mr. McMillin was interviewed by a local reporter (on March 27), that gentleman said the Laclede Company had not yet fully decided what action it would take to prevent the enforcement of the new law, but he said that one thing was positive, which is that the Company would not make the reduction called for in the ordinance. He did not think the Company would decide to take action in the matter immediately after the bill becomes a law, as there was no hurry. The Company will not collect from consumers for about a month, and the time for the collection of the rates after the 90 cent gas bill is in force will be time for action. What the Company would do would be the result of mature deliberation. It is probable that the citizens who object to the payment of the present gas rate will be the first to declare war, although the fact that one of the officers of the Company may be arrested on the charge of committing a misdemeanor under a city ordinance may induce the Company to bring matters to an immediate crisis, and not wait for the action of the city or the citizens. Regarding the reduced gas rate bill, Mayor Noonan said: 'The fact that I did not favor the provisions of the bill and vetoed it when sent to me by the Assembly will not deter me from doing my duty, which is to see that city ordinances are enforced. I do not know what my first step will be, as I do not know what turn circumstances may take, but I will instruct Counselor Bell to look after any cases arising in the courts out of the matter, and I may send instructions to the police. The reduced gas rate bill becomes a law on the 29th, and it is my duty to see that the law is observed. I will not stand passively by because in my opinion the bill was not equitable, but will see that every step is taken to insure its observance.' City Counselor Bell said: 'As City Counselor of St. Louis it is my duty to attend to all litigation arising from the non-observance of the city ordinances, and when the reduced gas rate bill becomes a law it will be my duty to insist upon its observance as energetically as any other. What steps I may take will be decided by the instructions I receive from Mayor Noonan, and the turn of affairs after the bill becomes a law. However, I do not expect to take the first steps in the matter. The Laclede Gas Company will

doubtless take out a writ of injunction to prevent the enforcement of the city ordinance relating to the reduction of the gas rate to consumers, pending litigation to have the ordinance declared illegal and invalid. This I conceive will be the only step that will prevent a more unpleasant and summary course of proceedings on the part of the city. If the Company does not take out an injunction, but, nevertheless, persists in charging the present rate, even after the new law has gone into effect, one of the officers may be arrested on a charge of misdemeanor, and the litigation commenced in this wise. As soon as the reduced gas rate becomes a law it will be enforced.'"

THE proprietors of the Stoughton (Mass.) Gas Company have announced a reduction in gas rates, from $6 to $4.95 per 1,000. The Company manufactures a "high candle power pure oil gas."

IN the Manufactures Committee, Massachusetts Legislature, many matters of general interest to the fraternity have either been considered or are under consideration during the present session of the Legislature.

THE Committee on Finance, Milwaukee (Wis.) Council has wisely adopted a resolution "indefinitely postponing" consideration of the resolution appropriating a certain sum for the purchase by the city of an "experimental electric lighting plant."

AT the annual meeting of the Middletown (Conn.) Gas Light Company the following officers were re-elected: President, A. B. Calef; Secretary and Treasurer, F. E. Camp; Superintendent, J. H. Jones.

THERE is every indication that at the annual meeting of the shareholders in the Montreal (Can.) Gas Company a proposition will be indorsed that will increase the capital stock in the sum of $500,000. The sum thus raised is to be devoted to paying for plant betterment and extensions.

THE Select Council of Philadelphia has negatived the proposition to raise $250,000, the said sum to have been expended in the installation of a municipal electric lighting plant.

WE understand that Chas. P. McGuire and associates have signed their names to an acceptance of the fuel gas charter recently passed for them by the authorities of St. Joseph. Under its conditions McGuire & Co. were allowed 25 days in which to accept the franchise, and an additional 60 days in which to file the bond of $20,000 as a guarantee that the work be undertaken under the stipulations imposed.

MESSRS. R. D. WOOD & CO., of Philadelphia, will build the new gasholder for the Citizens Gas Company, of Newark, N. J. We understand that its capacity is to be 400,000 cubic feet.

THE new plant of the Duluth (Minn.) Gas and Water Company, at Rice's Point, is completed.

WE obtain the following from a Newark correspondent: "Mr. Dusenbury, Secretary of the Newark (N. J.) Gas Company, when appealed to for information concerning the rumors that Mr. Vanderpool's present trip to Europe was to make arrangements for the sale of the Newark Company's plant to an English syndicate, said: 'It is not true that our Company contemplates selling out to a syndicate, nor are making any negotiations for that purpose. Some little time ago we were approached by a representative of an English syndicate with a question whether we would name a price for our concern. The reply was given that the concern was not for sale, and that no price would be named. Since that time the negotiations, if they could be called such, were entirely broken off. The visit of Mr. Vanderpool, our President, to Europe has nothing to do with this business. Mr. Vanderpool goes to Europe simply because this is a time when he can go conveniently. The objects of the trip are two-fold. One is that he goes for recreation, as he is a very hard working man; the other object is to inform himself in regard to all the new processes and discoveries in the manufacture of gas, and to see all the new appliances for the use of gas, such as stoves, burners, etc. This last is especially in view of the fact that we are putting a new show room in the rear of our office building, which is especially designed for the exhibition of stoves, burners and gas apparatus of all descriptions.' President A. A. Smalley, of the Citizens Gas Company, whose interests are, to say the least, in no wise inimical to those of the old Company—also said: 'No negotiations for the sale of the Citizens Gas Light Company have ever been made or proposed. No offers to sell have been made by us nor have any propositions for purchase been received. The Directors have no power to sell or to agree to sell without the consent of the stockholders. No proposition has been made or advanced in any form for a consolidation of the Citizens with the Newark Gas Company. Neither Mr. Vanderpool, Mr. Murphy, nor anyone else at home or abroad, is authorized to represent the Citizens Company in any relation whatever.'"

GENERAL HICKENLOOPER says that there is not a word of truth in the recent statements circulated in Cincinnati to the effect that the Cincinnati Gas Light and Coke Company is interested in the fortunes of the local branch of the Thomson-Houston Electric Light Company.

THE following is the full text of the bill now before the Rhode Island Legislature, to charter the Wakefield Manufacturing Company, which seeks to supply and sell gas in the cities of Providence and Pawtucket:

Section 1. Charles H. Henshaw, J. Edward Addicks, Samuel Little, Michael M. Cunniff, Spencer Borden and their associates and successors and assigns are hereby created a corporation by the name of the Wakefield Manufacturing Company, for the producing, making, generating, selling, using and supplying gas in the cities of Providence and Pawtucket for lighting, heating, mechanical and other purposes, and also for the purpose of manufacturing, using and dealing in all machinery, lamps, pipes, apparatus and appliances pertaining to the use of gas, and also with power to purchase, own, hold and dispose of shares of the capital stock of corporations in this State and other States, and bonds and other securities of such corporations, provided, however, that nothing in this act contained shall be so construed as to authorize said Wakefield Manufacturing Company to carry on a banking or stock brokerage business, and for the purpose of transacting any other business connected with the purposes and powers herein authorized, with all the powers and privileges and subject to all the duties and liabilities set forth in chapters 152 and 155 of the Public Statutes, and in the statutes and amendments thereof and in addition thereto.

Sec. 2. Section 2 of said act shall be amended so as to read as follows:

Sec. 3. The capital stock of said corporation shall not exceed $5,000,000, to be paid in amounts from time to time, and divided into such number of shares, the par value of such shares to be fixed and the transfer of such shares to be made in such manner as the corporation may, by vote of its by-laws, determine.

Sec. 4. Said corporation, upon filing its bond in said city of Providence or Pawtucket in the sum of $25,000 with the treasurer of said city or cities, to secure the putting of the streets and highways in said city or cities wherein it may choose from time to time to exercise the powers to it granted by this act in as good order and condition as said streets and highways were in at the places wherever said corporation may do work at the time of commencing work thereon, may open the ground in any part of said streets or highways for the purpose of laying, putting in and down and repairing pipes and other appliances for the use and the conducting of gas, and for any other purposes necessary or incidental to or convenient for the exercise of the powers granted by this act.

Sec. 5. Said corporation shall have an office or place of business in the city of Providence, and there shall be an annual meeting of the stockholders in the city of Providence at such times as the by-laws shall prescribe for the choice of officers, and for such other business as may come before them, and this act shall take effect from and after its passage.

AT a meeting of the stockholders of the Terre Haute (Ind.) Fuel Gas Company the following Directors were elected: Messrs. R. S. Tennant, J. R. Kendall, C. M. Warren, H. P. Townley, W. Kidder, A. Z. Foster and Capt. J. B. Archer. The proprietors assert that their preliminary tests with the plant have answered all expectations.

THE Caloric Light and Fuel Company, to do a general lighting and heating business, has been chartered in Chicago, by Messrs. M. Goldsmith, H. G. Coffee and J. L. Kerr. It is capitalized in $150,000.

ACCORDING to the Flint (Mich.) *Journal*, Bay City (Mich.) has been doing its own electric lighting at an annual cost of $90 per year per arc, but now that a private corporation has offered to perform the work at $60 per lamp the city proposes to retire from the field.

THE total revenue collected during the year for the inspection of gas meters in Canada was $7,922, as compared with $6,946 collected in the previous year. The total expenses of the department of inspection were $18,538 as against $20,894 for the previous year; 104 tests of Toronto gas were made, and on no occasion did it appear to be below the standard. Belleville gas was once below the standard, Cornwall 5 times, and Ottawa 19 times.

AT a meeting of the Rhode Island Senate Committee on Corporations (held Friday, March 27), a public hearing was had on an act in amendment of an act entitled "An act to incorporate the Columbia Land Company," in which Chas. A. Henshaw, J. Edward Addicks, Samuel Little, Michael M. Cunniff, Spencer Borden and their associates petition to be incorporated under the name of the Wakefield Manufacturing Company for producing gas in the cities of Providence and Pawtucket. The Senate chamber was crowded in every part with prominent citizens from all parts of the State. Senator Wilbour took the chair and called upon those in favor of the act. Mr. S. A. Cook, Jr., said they started with the assumption that an act whose purpose it is to introduce a new industry into the State for fair and honorable competition will be looked upon favorably by the committee. The course of legislation in the past would warrant that assumption. They could not understand the reason of the opposition to capital coming into the city, increasing the taxation value and giving additional employment, especially at a time when there was an outcry against money going out of the State. The course of legislation of the State had been to grant any fair business enterprise the right to enter the field. If this act is refused, it will, perhaps, be the only instance where a competitor asking for incorporation has been so treated. He argued that the Company could only succeed by offering a better product at a greater price, or the same product at a lower price. The granting of a charter forces no one to take the product. He considered it was the duty of the remonstrants in the first place to show why the charter should not be granted. Senator Wilbour said it was the custom to hear the friends first. Mr. J. E. Addicks protested to being considered a foreigner. As a Baptist he felt he had some part and lot in the State of Roger Williams, and as a citizen of Delaware, he ought to have some regard from the other little State. He was a competitive gas man, and had been a merchant all his life. It was not until he reached the gas business that he found it disreputable to enter the gas business. He had been in it six or seven years. As a result of his appearance before the Legislature, in Newport last year the price had been reduced and water gas introduced. He desired to come right in with his associates and enter into fair competition. There was enough business in the city for two companies. His standing as a man was open for investigation, and newspaper talk did not affect him. He had tried to interest Providence gentlemen in the movement, but the power of the old corporation was so great that no one seemed to have courage. There was money enough behind the Company to carry on the business. City Solicitor Van Slyck said the city through its officers desires to control the municipality and not give up the rights of its streets to any corporation however respectable. Here was a bill unparalleled in the history of legislation in the State. It would permit the corporation to do anything it liked, and the injury to Westminster street would cost more than the $25,000. It was a street so laid down that a strip could not be taken up and put back in the same condition, and this was to be done by a corporation over which the city was to have no control. The State never had enacted such legislation. He was not here to oppose the granting of the charter, but to ask that it be fixed as it always is, giving the Constitutional authorities control. If the committee permits this bill, it should stand upon the consent of the City Council. The old bill was subject to the Board of Aldermen, but the Common Council had grown sufficiently to warrant it in taking control of its highways. Mr. William A. Roelker appeared on behalf of the Providence Gas Company. The first that was heard of Mr. Addicks in Rhode Island was at the last May session in Newport, when he petitioned for an Act which is the same as the one presented to-day, with the exception that the most objectionable features were omitted. The Act which they asked for at Newport had a section providing that they should use the streets subject to the Board of Aldermen. That was now stricken out, and a bond substituted. Another difference was the power to purchase stock of other corporations. No such clause was to be found in any other Acts incorporating similar companies. It must have been put there for a purpose. He rehearsed the methods by which the bill had reached the present stage, and questioned the parliamentary correctness and fairness. It seemed to him that when a bill came with such extraordinary provisions and passed in such an extraordinary manner, there was something suspicious about it, and should have most careful consideration. The Company he represented had served the community well, at fair prices. There were nearly 1,000 shareholders in the Company, and all but 100 live in Rhode Island; and the stock was equally divided between men and women. They are our own people, and have a right to ask for fair treatment, and that you will not put a club into the hand of a corporation. Mr. Addicks was mistaken in supposing the price had been reduced on account of his appearances at Newport. The result of that gentleman's operations in Chicago was a gas trust. The average price in Boston to day was $1.67, here it was $1.40; that is how he has benefited Boston. Referring to the Delaware letter, he said it was a case of a highwayman's "stand and deliver." It was plain on the face of it what Mr. Addicks wanted. He wanted a club put in his hand with which to strike the citizens down. Lieutenant-Governor Darling, of the Pawtucket Gas Company, said their stock was largely owned in that city and neighboring towns, and the passage of the Act would be great hardship to them. Mr. S. G. Stiness, Superintendent of the same Company, said competition had always resulted in a combination sooner or later, and the cost of it would eventually have to come from the pockets of the public. The Providence Gas Company has not increased its stock for many years, and the Pawtucket Gas Company had not increased its construction expenses until they gave the city electric light. The public was reaping the benefit from the small capital upon which dividends had to be paid. The policy which had been pursued in the past would be that of the future. They had reduced the price of gas from $3.50 to $1.53. Mr. L. M. Cook appeared as a citizen against the admittance of this corporation. The changing of the title of the Act would not have given any idea but what it was to be a little manufacturing company in Wakefield. If there was any agreement that there was need of a Constitutional amendment, it was such Act as this. Every measure brought before the House should be printed. If they could have had that rule in the House of Representatives, the Senate would not have been troubled with the matter. Mr. John F. Lonsdale protested against the bill appearing before the Senate with the indorsement of the House. The sense of that body was not taken upon it, it being run through with a lot of other charters.

A CONTROVERSY has arisen between the Jersey City Gas Company and the United Gas Improvement Company, relating to taxes on the former corporation. We have been informed that the latter Company in leasing the former agreed to assume all taxes on that corporation and pay them a clean dividend of 10 per cent. annually on the amount of stock of the Jersey City Company. The question in dispute is relative to the State taxes, which the United Gas Improvement Company refuse to pay, and for which no doubt a suit will be instituted.

THE Woburn (Mass.) Gas Light Company has declared a semi-annual dividend of 4 per cent.

SUIT has been begun in the Supreme Court by Margaret Sullivan against the California Electric Light Company, of San Francisco, to enjoin it from operating machinery on the premises on Jessie street, near Third. The plaintiff owns a house adjoining the works, and alleges that the machinery makes so much noise that it is impossible to carry on an ordinary conversation in her house; also that the jarring of the machinery has shaken her house so as to cause the plastering to fall from the walls and ceiling. She has therefore been unable to lease or rent the house, and rather than let it remain unoccupied has been compelled to live in it with her family and suffer these annoyances in question. In addition to the injunction $10,000 damages are asked for.

GREENFIELD, MASS., March 29, 1890.—The voters will have another field day Monday afternoon, when they will close up the business of the annual town meeting. Were it not for the proposed wrestling match between the stockholders of the Electric Light and Gas Companies to see which Company can secure the contract to light the streets for five years, the session would be a tame affair. Some committees are to report, including one on the subject of buying a new almshouse nearer to where the poor people live, but this scheme, like others that are not quite ripened, will be quickly shelved on a motion to carry it over until the next annual meeting. Not so with the illuminating question. An attempt was made last week to have the selectmen assume the responsibility, but when the subject was opened up and the town fathers saw some of its bearings, they with one accord begged to be excused, preferring that their wise constituents should father the job. As a result a dozen of the lawyers and business men have been bottling up their oratory for Monday's contest. The gas people will urge that inasmuch as they pay about $450 in taxes against less than half that amount as paid by the electric light concern, it is no more than fair that they should be given a wee bit of the public patronage. There are a great many who will strenuously oppose the making of a contract with any company for 5 years, on the ground that many changes are likely to be made during that time which will cheapen the lights, and of which the town should have the advantage. Of course, the farmers will generally come in to oppose the appropriation of any very liberal sum for any kind of light. —*Springfield Republican.*

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

EDITOR—Jos. R. Thomas, C.E.
ASST. EDITOR—T. J. Cunningham.
MANAGER—C. E. Sanderson.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 42 Pine Street, New York.

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MONDAY, APRIL 7, 1890.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks.
16 WALL ST., NEW YORK CITY.
APRIL 7.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	96¾	97
Central	500,000	50	—	—
" Scrip	220,000	—	—	—
Equitable	4,000,000	100	117	119
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	115	120
Mutual	3,500,000	100	109	112
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Standard Gas Co—				
Common Stock	5,000,000	100	—	45
Preferred	5,000,000	100	84	87
Yonkers		50	112	—
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	109	112
Citizens	1,200,000	20	—	64
" S. F. Bonds	320,000	1000	100	103
Fulton Municipal	3,000,000	100	124	126
" Bonds	300,000		104	105
Peoples	1,000,000	10	80	82
" Bonds (5's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	1,000,000	100	96	—
Nassau	1,000,000	25	120	—
" Ctfs	700,000	1000	100	102
Williamsburgh	1,000,000	50	123	125
" Bonds	1,000,000	—	108	112
Out of Town Gas Companies.				
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	93	93¼
2d " " "	3,000,000	1000	71	72
Bay State Gas Co.—				
Stock	5,000,000	50	23½	25
Income Bonds	2,000,000	1000	—	—
Buffalo Mutual, N. Y.	750,000	100	90	95
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
" " Bonds.	45,000	—	—	—
Chicago Gas Trust	25,000,000	100	45⅝x	45½
Chicago Gas Light & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	93	93¼
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	102
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	100
2d "	2,500,000	1000	96	100
Consumers Gas Light Co., Jersey City	2,000,000	100	15	25
Bonds	600,000	1000	80	—
Cincinnati G. & C. Co.	6,000,000	100	201	203
Consumers Toronto	1,000,000	50	190	200
Central, S. F., Cal.			80	90
Capital, Sacramento, Cal			58	
Consolidated, Balt.	11,000,000	100	48¼	48½
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	75	90
Bonds	250,000		—	—
Hartford, Conn.	750,000	25	102	108
Jersey City	750,000	20	186	190
Laclede Gas Light Co., St. Louis, Mo.—				
Common Stock	7,500,000	100	14	17
Preferred "	2,500,000	100	—	—
Bonds	9,034,400	1000	82½	83
Louisville, Ky.	2,570,000	50	125	130
Little Falls N. Y.	50,000	100	—	100
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	200	208
Memphis (Tenn.) Gas	750,000	100	48	51
" Bonds.	240,000	100	103	—
New Haven, Conn.		25	200	—
Oakland, Cal.			35	35½
Peoples, Jersey City		—	60	61
" " Bonds.			—	—
Paterson, N. J.		25	99	102
Rochester, N. Y.		50	99	100
Syracuse, N. Y.	500,000	25	—	—
San Francisco Gas Co. San Francisco, Cal.	10,000,000	100	55½	55¾
Washington, D. C.	2,000,000	20	200	208
Wilmington, Del.		50	88	90

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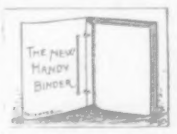

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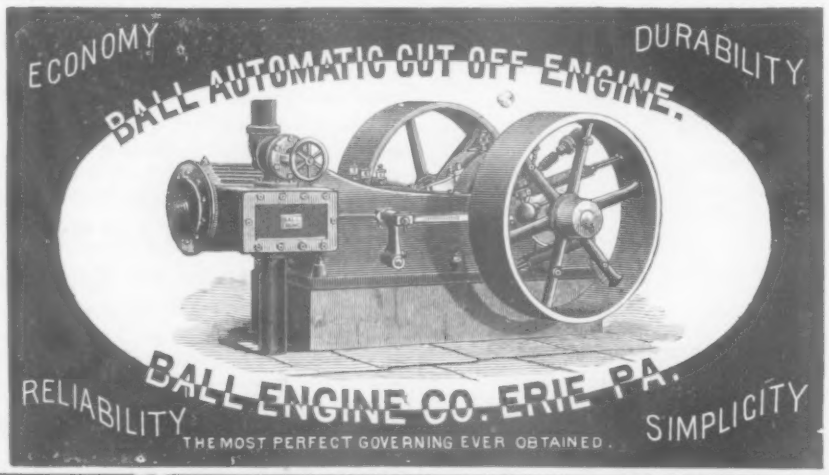

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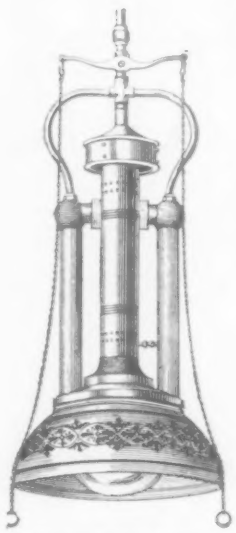

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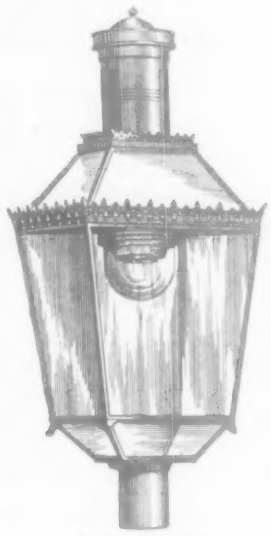

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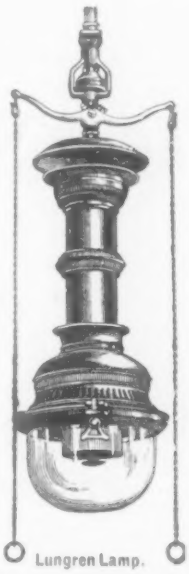

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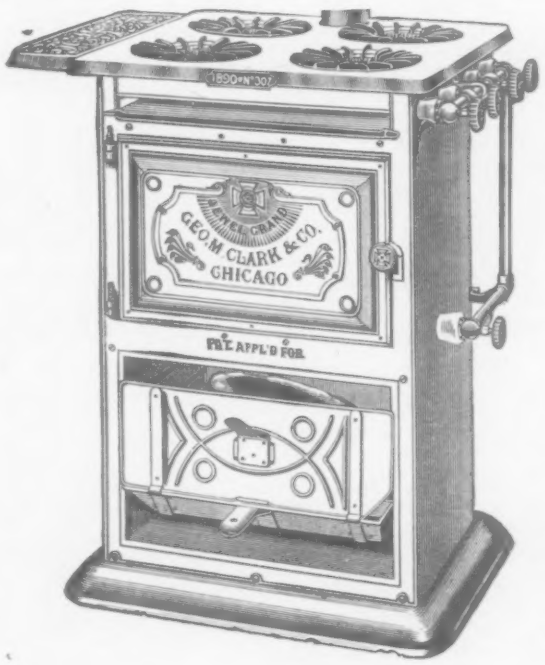
At the Fall Session of the Board of Supervisors of Winnebago County, held at the County Court House, Oshkosh, Wis., Nov. 26, 1889, the report submitted by Mr. C. W. Cook, Chairman of the Committee on Public Buildings, recommending the use of the Welsbach Incandescent Gas Burner in the Buildings under their charge, was unanimously adopted, because of the extreme economy in the consumption of Gas and the superior character of the light obtained.



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MANUFACTURED BY

GEORGE M. CLARK & COMPANY,

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EVERY CONCEIVABLE SIZE AND STYLE,

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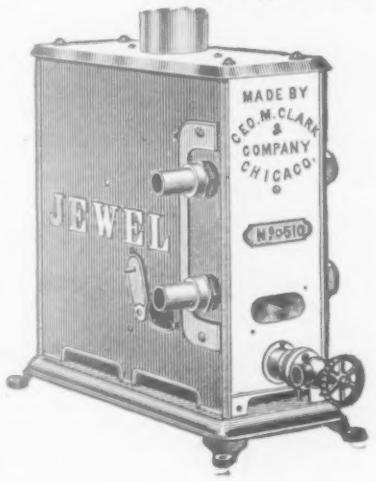
Write for our 1890 Catalogue and see for yourself.



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The total capacity of Springer Apparatus now in use is over 25,000,000 ft. daily.

THE SPRINGER CUPOLA SYSTEM

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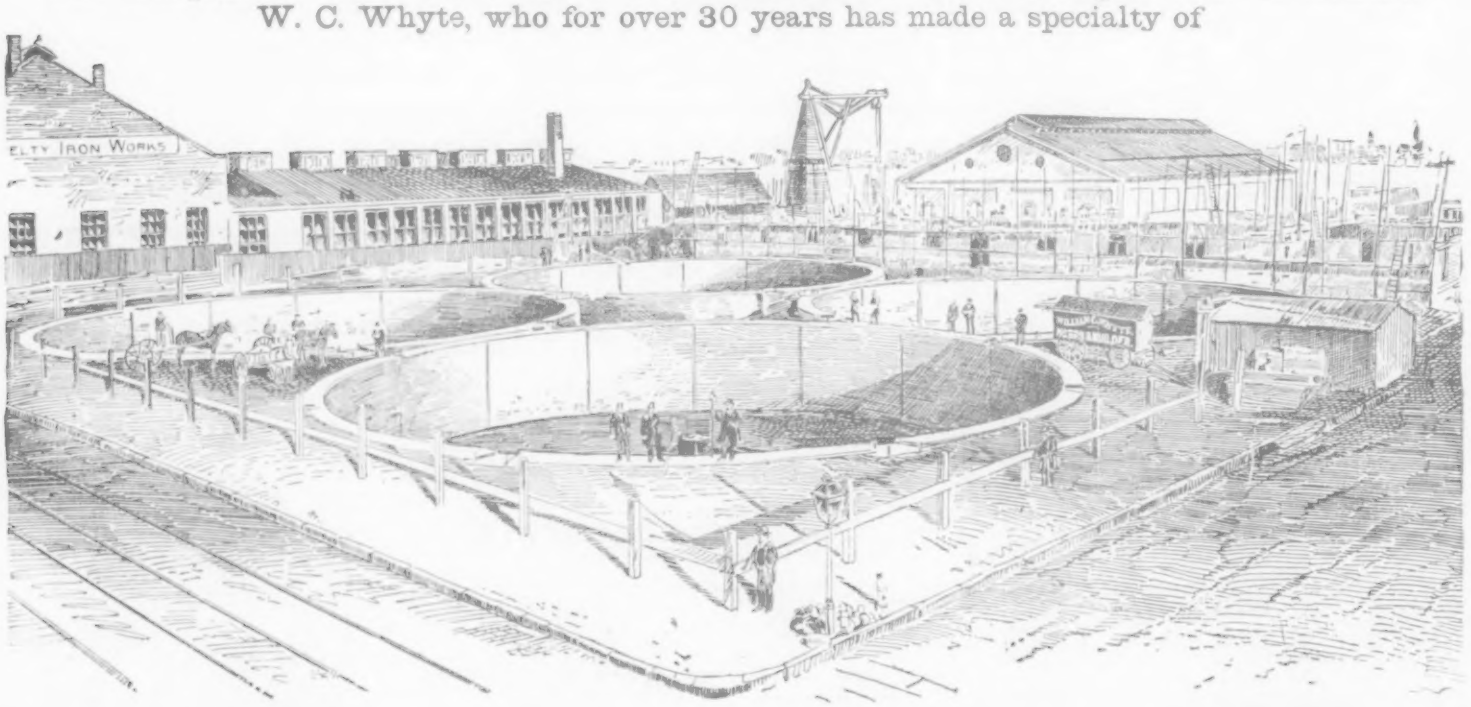

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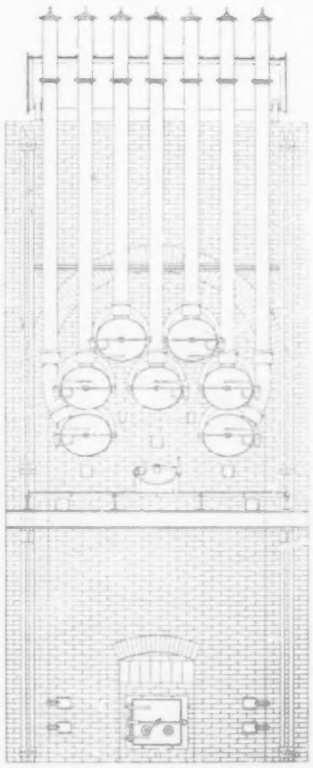

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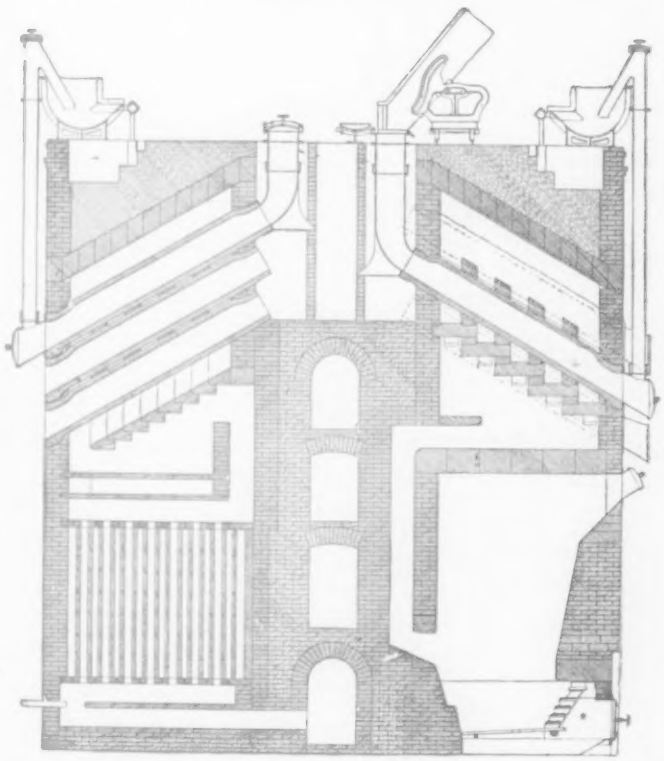

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KIRKHAM, HULETT & CHANDLER, LIMITED.

PATENT "STANDARD" WASHER-SCRUBBERS

Erected and in course of construction at present date:

	Capacity. Cubic feet per day.
Altrincham	600,000
Adelaide	600,000
Aldershot	200,000
Allegheny, U. S. A.	1,000,000
Ashton-under-Lyne	1,250,000
Amsterdam	1,500,000
"	1,500,000
Annaberg	200,000
Arcachon	100,000
Animal Charcoal Co	200,000
Altoona, U.S.A.	350,000
Buxton	250,000
Bradford	1,000,000
"	1,250,000
"	1,250,000
"	1,250,000
"	1,000,000
"	1,000,000
"	3,000,000
Bremen	150,000
Baltimore, U.S.A.	1,000,000
"	1,900,000
"	1,000,000
Balmain, N.S.W	125,000
Bishops Stortford	150,000
Blackpool	400,000
Brussels	1,250,000
"	1,250,000
"	750,000
"	1,250,000
Banbury	250,000
Birmingham	5,000,000
Birkenhead	2,500,000
Blackburn	1,500,000
Bochum	600,000
Burntisland	250,000
Boston, U.S.A.	2,000,000
Brisbane	1,500,000
"	300,000
Burton-on-Trent	1,500,000
Barcelona	350,000
Barking	100,000
Baerlien & Co	20,000
"	20,000
Bombay	400,000
Buffalo, U.S.A., Mutual	750,000
" " **Citizen**	500,000
Brookline, U.S.A.	500,000
Bergen	350,000
Berlin	1,250,000
Bournemouth	1,000,000
Bridgeport, U.S.A	500,000
Brunswick	300,000
Beck & Co., St. Louis	100,000
Barmen Rittershausen	600,000
Bexhill	125,000
Brooklyn, U.S.A	1,000,000
"	1,000,000
" **Nassau**	1,000,000
Brunner, Mond & Co.	400,000
Cheltenham	2,000,000
Cannes	200,000
Croydon	1,500,000
Copenhagen	200,000
Clevedon	200,000
Columbus, U.S.A	500,000
Cincinnati, "	1,500,000
" "	1,500,000
Chicago "	3,000,000
" "	1,000,000
" "	1,000,000
Chemnitz	1,000,000
Crewe	1,250,000
Colonial Gas Works Co	100,000
Cadiz	300,000
Charlottenburg	600,000
Dudley	750,000
Driffield	100,000
Dukenfield	500,000
Dover	750,000
"	1,000,000
Deal	200,000
Derby	1,500,000

	Capacity. Cubic feet per day.
Dublin	3,000,000
Dowlais	100,000
Douai	500,000
Denton	500,000
Derby, U.S.A	350,000
Denver, "	500,000
" "	1,000,000
Dusselldorf	750,000
"	500,000
Dumfries	250,000
Dunedin, N.Z	400,000
Darlington	1,250,000
Detroit, U.S.A	750,000
Edinburgh	1,500,000
"	2,000,000
Enfield	300,000
Essen	300,000
Elbing	150,000
Falmouth	150,000
Frankfort	300,000
Farnworth	400,000
Fenton	400,000
Friedenshutte	500,000
Furth	400,000
Freiburg	200,000
Goole	250,000
Glossop	300,000
Guildford	300,000
Gloucester	1,250,000
Gera	300,000
Grafton, N.S.W	100,000
Grieg	300,000
Georgetown, U.S.A	250,000
Gluckauf	200,000
Heywood	600,000
Holywood	125,000
Huy	70,000
Harrow	250,000
Harrogate	250,000
Halstead	150,000
Heilbronn	200,000
Havana, Cuba	750,000
Hastings	1,500,000
Huddersfield	300,000
"	750,000
"	1,500,000
Hof	200,000
Hampton Wick	500,000
Heckmondwicke	500,000
Haverfordwest	100,000
Halifax, N.S.	350,000
Hamm	200,000
Halle	400,000
Heidelberg	300,000
Hartford, U.S.A	1,000,000
Ilkeston	300,000
Inverness	250,000
Ilkley	200,000
Ilford	100,000
Kingston-on-Hull	400,000
Kidderminster	750,000
Kidsgrove	100,000
Konigberg	1,000,000
King's Lynn	300,000

LONDON:—

The Gaslight and Coke Co.:	
Beckton	1,250,000
"	1,250,000
"	1,250,000
"	1,250,000
"	1,250,000
"	1,250,000
"	2,500,000
"	2,500,000
Silvertown	1,000,000
Bromley	2,000,000
"	1,500,000
"	1,500,000
"	1,500,000
"	2,000,000
"	1,500,000

LONDON—*Continued.*	Capacity. Cubic feet per day.
Shoreditch	2,500,000
Pancras	1,500,000
"	1,500,000
Pimlico	2,000,000
Nine Elms	3,000,000
"	3,000,000
South Metropolitan Co:—	
Greenwich	3,000,000
Woolwich	400,000
Vauxhall	3,000,000
"	3,000,000
Lea Bridge	300,000
West Ham	1,500,000
Leeds	2,000,000
"	3,000,000
"	3,000,000
"	3,000,000
"	3,000,000
"	2,000,000
Leominster	150,000
Leiden	560,000
"	600,000
Liverpool	2,000,000
"	2,000,000
"	2,000,000
"	2,000,000
"	2,000,000
"	3,000,000
Lincoln	1,000,000
"	600,000
Lowell, U. S. A	1,000,000
Louisville "	1,500,000
Long Eaton	500,000
Lilie	900,000
"	450,000
"	750,000
"	250,000
"	250,000
Luckenwalde	330,000
Liegwitz	300,000
Lincoln, U. S. A	250,000
Lawrence "	500,000
Lynn "	300,000
Lyons	1,500,000
Maidstone	1,000,000
Marseilles	1,500,000
"	1,500,000
Mons	500,000
Malines	250,000
Melbourne	1,500,000
"	1,500,000
"	1,500,000
"	1,500,000
"	1 500,000
Manchester	2,500,000
Middleton	400,000
Manley, N. S. W.	100,000
Minneapolis, U. S. A	750,000
Magdeburg	300,000
Memphis, U. S. A	750,000
Nottingham	1,250,000
"	2,500,000
"	2,500,000
"	2,000,000
"	1,500,000
"	2,000,000
Newport, U.S.A	430,000
Newmarket	150,000
Newark, U.S.A	680,000
Northfleet	200,000
New York, U.S.A	2,000,000
Nice	600,000
Newcastle, N. S. W.	200,000
Numea, "	100,000
Namur	250,000
Newark	350,000
Oldbury	500,000
Otley	200,000
Oswestry	250,000

	Capacity. Cubic feet per day.
Ober Schlesian	1,500,000
Otto & Co.'s Coke Works	1,500,000
Plymouth	2,000,000
Parramatta, N. S. W	100,000
Prescott	150,000
Providence, U.S.A	750,000
"	750,000
Plauen	300,000
"	300,000
Portsmouth	2,500,000
"	2,500,000
Pittsburgh, U.S.A	1,500,000
Portland, "	560,000
Pawtucket, "	500,000
Quebec	250,000
Radcliffe	750,000
Rouen	250,000
Ramsgate	1,000,000
Reigate	200,000
Richmond, U.S.A	250,000
Roxbury, "	500,000
Runcorn Soap Co.	20,000
Rockhampton, N. S. W	125,000
Richmond	1,500,000
Reading	2,000,000
Reichenbach	200,000
Salford	1,750,000
"	1,750,000
"	1,750,000
Smethwick	750,000
Sydney, N. S. W	1,000,000
"	1,000,000
"	2,500,000
"	50,000
"	50,000
Sunderland	1,500,000
St. Josephs, U.S A	250,000
Spa	100,000
Sevenoaks	300,000
St. Petersburg	2,000,000
"	1,500,000
St. Louis, U.S.A	2,000,000
"	2,000,000
"	1,000,000
Laclede	1,000,000
Silesian Coal Co.	600,000
San Francisco, U.S.A	2,000,000
"	2,000,000
Sheepbridge Coal Co.	40,000
Stettin	200,000
Singapore	300,000
Sutton	500,000
Tonbridge	150,000
Tipton	400,000
Tottenham	1,000,000
Toledo, U.S.A	750,000
Toronto	1,000,000
Uxbridge	300,000
Valparaiso	500,000
West Bromwich	1,000,000
Willenhall	250,000
Weston super-Mare	500,000
Waltham	150,000
Wormwood Scrubs	300,000
Williamsburg, U.S.A	600,000
"	600,000
Wellington	150,000
Warwick	300,000
Wheeling, U.S.A	500,000
Walker	300,000
Westgate	100,000
Wilmington, U.S.A	500,000
Windsor, N. S. W.	100,000
Wolverton	100,000
Wellington, N. Z.	250,000
Whitchurch	175,000
Washington, U.S.A	2,000,000
Wallasey	750,000
Weimar	150,000
Wurzen	200,000
Worcester, U.S.A	750,000
Yeadon	500,000
Yeovil	250,000

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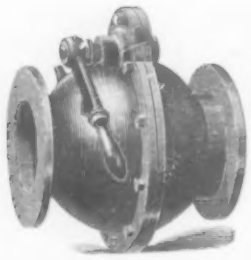

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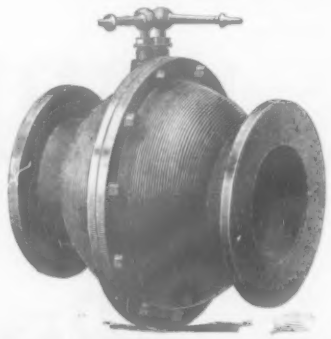

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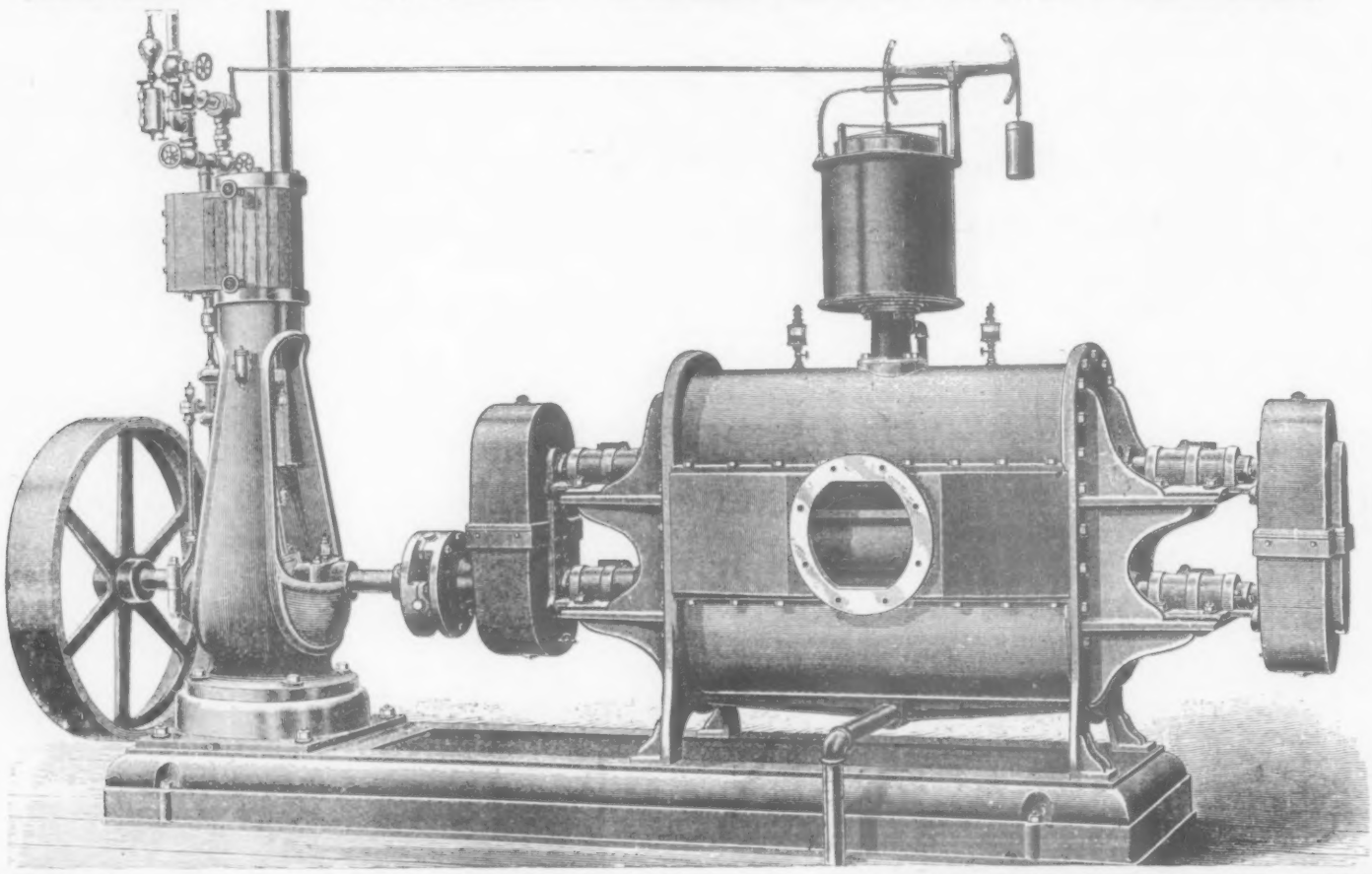

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AUTOMATIC GOVERNOR. Has been on the market but *three years*, and in that time has been introduced *more generally* than any invention ever designed for use in gas works. Over *two hundred* of them now in use. Sensitive; reliable; perfectly automatic; reduces leakage; satisfies consumers, and gives great relief to the Manager. No gas works is *complete* without one of these machines.

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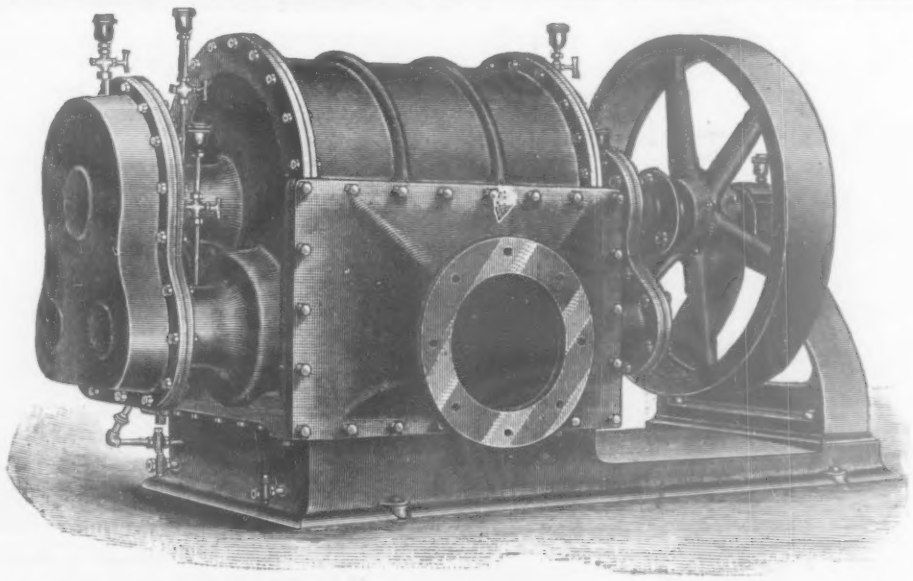

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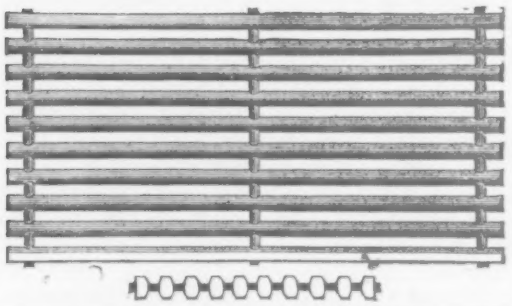

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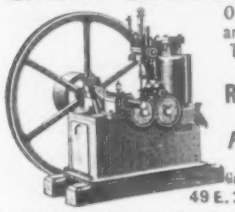

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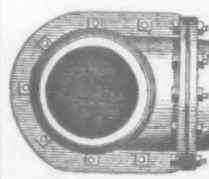

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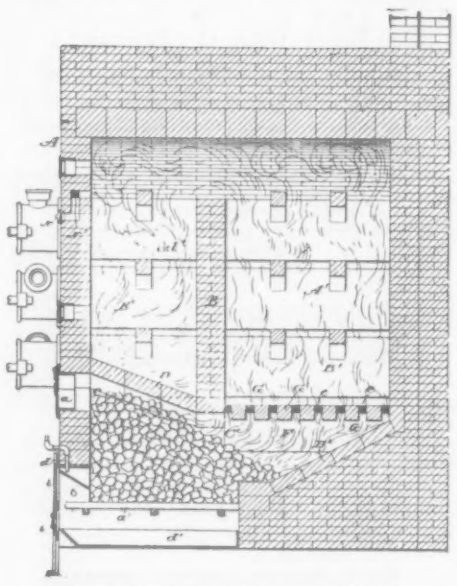

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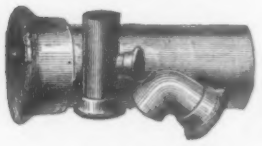

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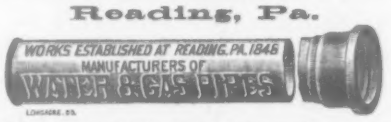

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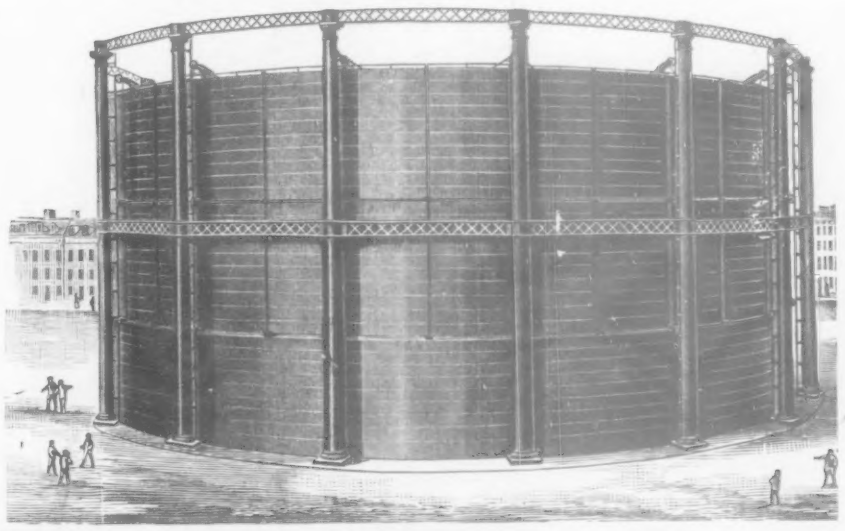

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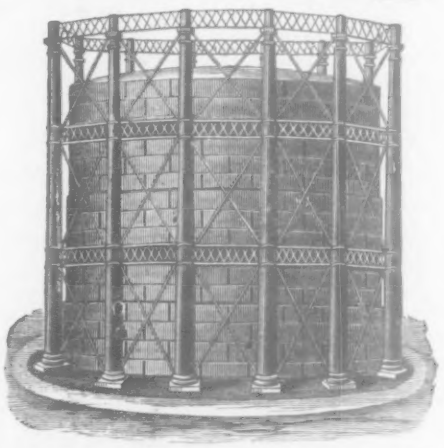

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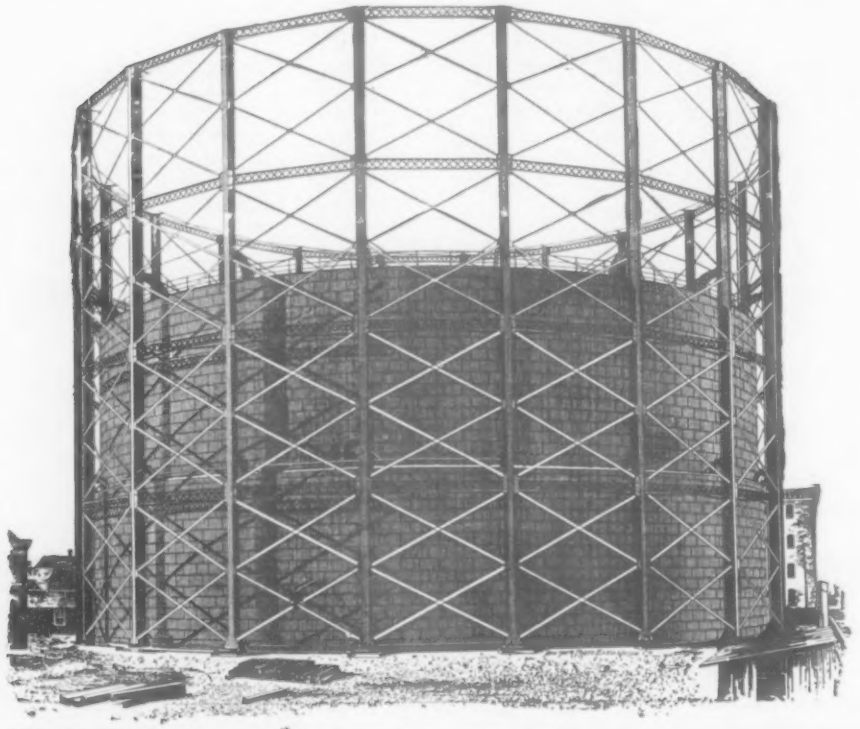

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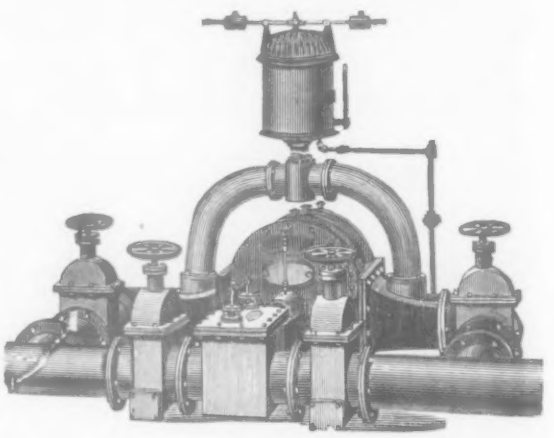

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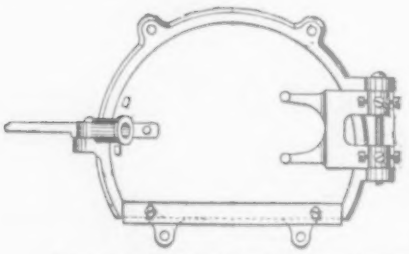

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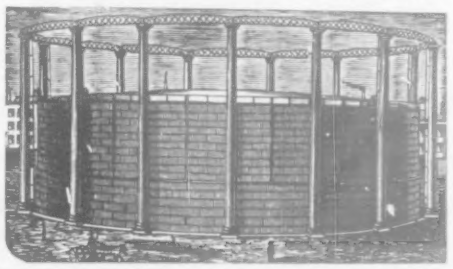
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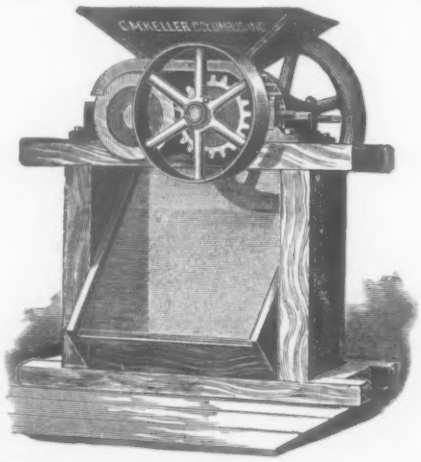

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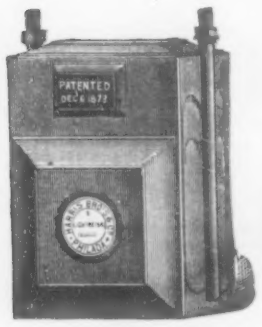

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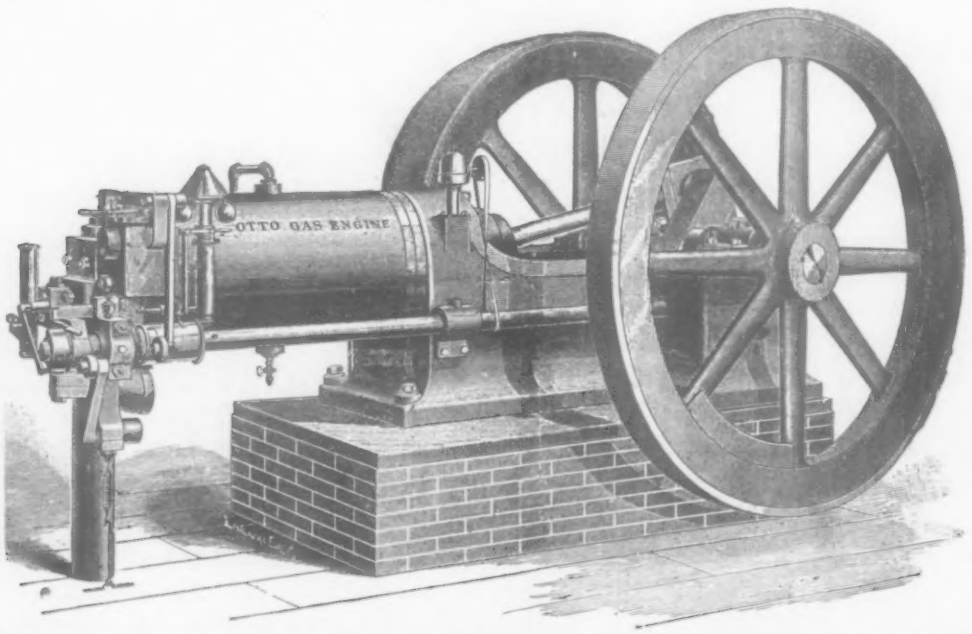

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